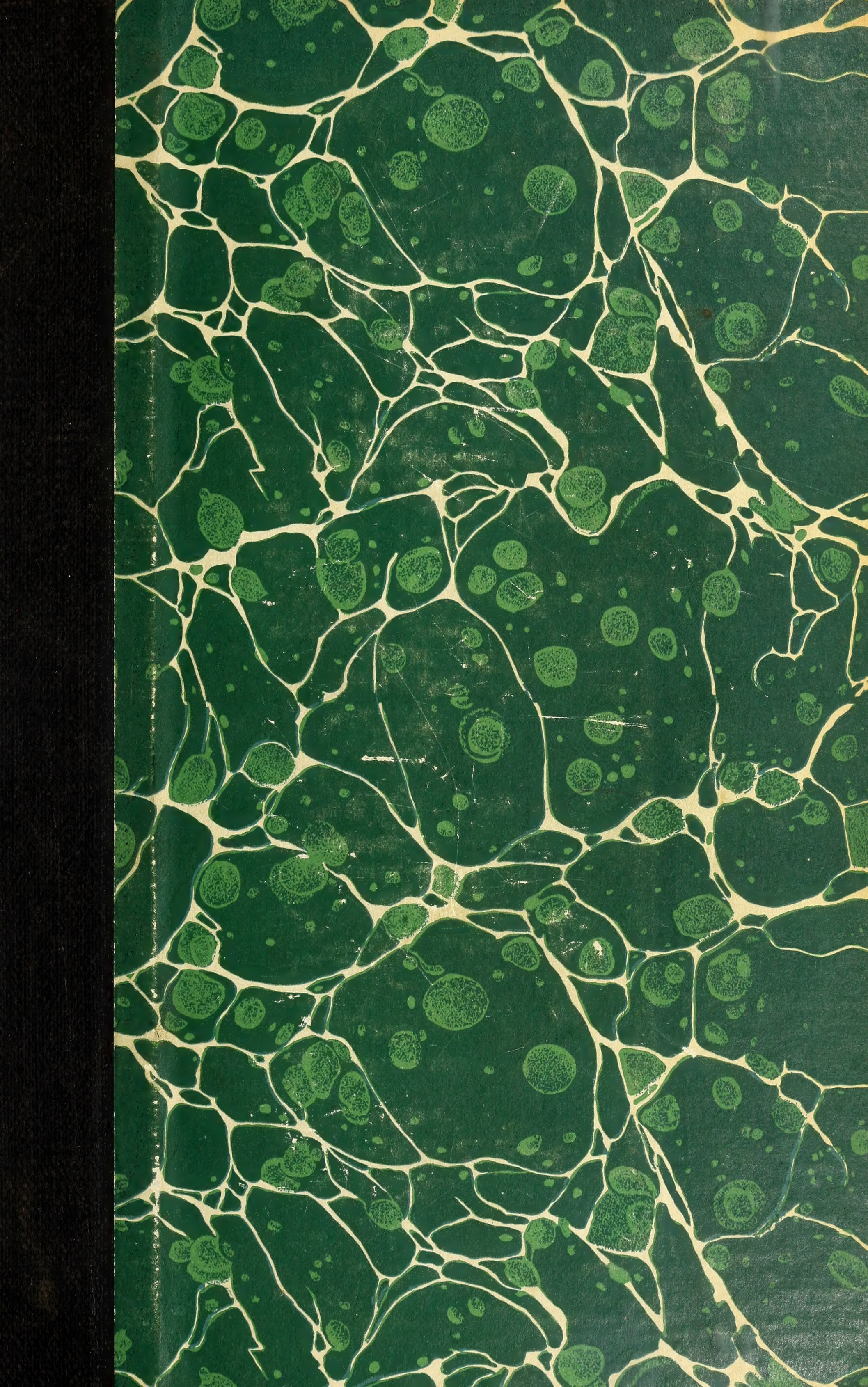

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XXIV 1929

EDITED (IN SUCCESSION) BY

F. G. SCHAUPP JOHN B. SMITH GEO. H. HULST
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G. P. ENGELHARDT E. L. BELL

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NEW SPECIES OF NEOBORUS AND XENOBORUS (HEMIPTERA, MIRIDAE).

By Harry H. Knight, Ames, Iowa.[1]

Neoborus wileyae n. sp.

Distinguished by the short, robust form, black color and prominent, sericeous, recumbent silvery white pubescence.

♂. Length 3.4 mm., width 1.8 mm. Head: width 1 mm., vertex .47 mm.; yellowish brown, tylus black. Rostrum, length 1.2 mm., reaching posterior margins of hind coxae, dark brown to blackish. Antennae: segment I, length .31 mm.; II, 1.12 mm.; III, broken; black. Pronotum: length .83 mm., width at base 1.49 mm.; basal margin sinuate at middle and between there and basal angles; lateral margins nearly straight, roughly carinate.

Black, the dorsum in part dark brownish black; head except tylus, propleura, anterior third of disk surrounding the black calli, yellowish brown; ostiolar peritreme white, tips of coxae somewhat brownish, otherwise the legs uniformly black; membrane black. Dorsum rather uniformly, coarsely and rather closely punctate; clothed with prominent, sericeous, recumbent silvery white pubescence. Embolar margins moderately arcuate, the edge finely but distinctly carinate.

♀. Length 4.4 mm., width 2.1 mm.; embolar margins strongly arcuate. Head: width 1.1 mm., vertex .56 mm. Antennae: segment I, length .30 mm.; II, .96 mm.; III, .38 mm.; IV, .27 mm.; black. Pronotum: length .90 mm., width at base 1.64 mm. More robust and embolar margins more arcuate than in the male, but very similar in coloration, pubescence and puncturation.

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[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Holotype: ♀, April 20, 1921, Eastland Co., Texas (Grace O. Wiley); author's collection. *Allotype:* same data as the type, *Paratypes*: 15 ♀ ♂, taken with the types "on Hawthorn blossoms" according to Mrs. Wiley's records. It is not positive that this species breeds on hawthorn (*Crataegus*) but the record is very suggestive. I take pleasure in naming this interesting species after the collector, Mrs. Grace O. Wiley, who collected this and other interesting species of Mirids for me.

Neoborus atratus n. sp.

Allied to *wileyae* but distinguished by the shorter rostrum and pale marks on the scutellum.

♂. Length 3.2 mm., width 1.6 mm. Head: width .96 mm., vertex .42 mm. Rostrum, length 1.05 mm., reaching to middle of hind coxae, brownish black. Antennae: segment I, length .29 mm.; II, 1.02 mm.; III, broken; black. Pronotum: length .75 mm., width at base 1.45 mm.; basal margin only very slightly sinuate at middle; lateral margins slightly sinuate, roughly, unevenly carinate.

Color black; head yellowish to brownish black, tylus and basal carina black, a brownish black circle on frons joining below with tylus; pronotum black, basal edge, median line, collar, and ray behind outer margin of each callus, yellowish; scutellum with basal angles, apex, and fine median line pale to yellow. Clothed with sericeous, recumbent, silvery pubescence. Pronotum and scutellum coarsely and closely punctate, more finely so on hemelytra. Membrane uniformly brownish black.

Holotype: ♂, June 7–17, 1916, Jemez Springs, New Mexico (J. Woodgate); author's collection.

Neoborus adeliae n. sp.

Runs to *palmeri* Reut. in my key (Hem. Conn., 1923, p. 561) but differs in several respects; the black clavus, median vitta on scutellum, and broad black rays on pronotum will distinguish it. Coloration suggestive of *illitus* Van D. but the long first antennal segment will distinguish this species.

♂. Length 4.3 mm., width 1.9 mm. Head: width 1.03 mm., vertex .46 mm.; vertex and frons sharply declivent; yellowish, tylus black, frons more or less brownish black. Rostrum, length 1.03 mm., reaching upon intermediate coxae, yellowish, apex black. Antennae: segment I, length .62 mm., black, sometimes yellowish beneath; II, 1.9 mm., black; III,

.68 mm., black; IV, .35 mm., black. Pronotum: length .96 mm., width at base 1.7 mm.; lateral margins straight, angulate, but scarcely carinate.

Dorsal surface nearly glabrous, a minute short hair arising on anterior edge of each puncture; punctate nearly as in *palmeri,* but calli less convex. Coloration pale to yellowish and marked with black; calli, wedge-shaped ray behind each callus extending to basal margin of disk, median vitta on scutellum, clavus, embolium and apical area of corium, apex of cuneus, two subapical bands on hind femora, band near base and on middle of hind tibiae, black. Venter and pleura dark brownish. Membrane and veins rather uniformly blackish.

♀. Length 4.7 mm., width 2.4 mm. Head: width 1.11 mm.. vertex .58 mm. Antennae: segment I, length .53 mm.; II, 1.27 mm.; III, .62 mm.; IV, .38 mm.; brownish black. Pronotum: length 1.09 mm., width at base 1.98 mm. Slightly more robust than the male but very similar in coloration, pubescence and puncturation.

Holotype: ♂, April 17, 1928, College Station, Texas (H. G. Johnston); author's collection. *Allotype:* taken with the type; returned to Mr. Johnston. *Paratypes:* ♂ ♀, April 12, 40 ♂ ♀, April 17, taken with the types on swamp privet (*Adelia parvifolia*) where Mr. Johnston found the species breeding, but only in shaded situations.

Neoborus adustus n. sp.

Allied to *glaber* Kngt., but distinguished by the more prominent pubescence, different color, and by the shorter first antennal segment which in length (♂) does not exceed width of vertex.

♂. Length 3.9 mm., width 1.66 mm. Head: width .98 mm., vertex .40 mm.; brownish yellow, tylus except base, and spot above base of antenna, blackish. Rostrum, length 1.06 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .34 mm., yellowish brown, blackish on anterior aspect; II, 1.09 mm., brownish black, III, .38 mm., black; IV, .37 mm., black. Pronotum: length .80 mm., width at base 1.46 mm.; coarsely and more sparsely punctate than *glaber,* especially on anterior half of disk; lateral margins of disk slightly sulcate, rounded and obsoletely carinate, the carinate line bordered by closely set coarse punctures; yellowish to brownish, dark brown on propleura, basal half of disk, and on inner half of calli. Scutellum slightly convex, coarsely and unevenly punctate; dull yellowish, a brow area each side of median line which contrasts only very slightly with the paler yellowish color on basal angles, apex and median line.

Dorsum clothed with fine, short, sericeous pubescence although obsolete on the pronotum; moderately shining. Color yellowish to brownish, darker brown on clavus and corium; cuneus uniformly pale yellowish translucent. Membrane and veins pale, tinged with brownish, a fuscous spot behind apex of cuneus and on middle of larger areole. Legs light yellowish brown, coxae pale yellowish, hind femora with two subapical dark brown marks, sometimes obsolete, tips of tarsi fuscous.

♀. Length 4.1 mm., width 1.9 mm. Head: width 1.02 mm., vertex .52 mm. Antennae: segment I, length .35 mm.; II, 1.03 mm., III, .40 mm.; IV, .36 mm. Pronotum: length .86 mm., width at base 1.6 mm. Very similar to the male in pubescence, puncturation and coloration, although usually slightly paler and more uniformly colored.

Holotype: ♂, July 15, 1915, Springfield, Missouri (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* 26 ♂ ♀, taken with the types on ash (*Fraxinus* sp.) 5 ♂ ♀, July 18, 1915, topotypic. 3 ♂ 2 ♀, April 12, 1928, College Station, Texas (H. G. Johnston), on *Fraxinus americana.*

Neoborus populi n. sp.

Runs to *canadensis* Van D. in my key (Hem. Conn., 1923, p. 561), but looks more like *pubescens* Kngt.; distinguished from the latter by the longer pubescence and black antennae.

♂. Length 4.2 mm., width 1.7 mm. Head: width 1.05 mm., vertex .40 mm.; frons and tylus rather prominent; yellowish, tylus, spot above each antennal socket, and mark each side of median line on frons, black. Rostrum, length 1.06 mm., nearly attaining hind margin of sternum, yellowish, apex black. Antennae: segment I, length .63 mm., black, somewhat paler on base; II, 1.75 mm., black; III, .92 mm., brownish; IV, .32 mm., yellowish. Pronotum: length .92 mm., width at base 1.5 mm.; calli prominent, black, surrounded by yellowish, becoming black on posterior half of disk but not joining with black on calli; lateral margins of disk slightly sinuate, not distinctly carinate.

Clothed with prominent, erect, pale pubescence, longer and more prominent than in *pubescens.* Coloration pale to yellowish and shaded with black, scutellum yellow, without indication of any vitta; calli, posterior half of pronotal disk but usually paler on median line, mesoscutum, inner half of clavus although paler basally, embolium except apex, outer margin of corium exterior to radial vein and extending obliquely across apical area of corium to inner angles, pleura and sternum, black. Cuneus clear, membrane and veins blackish. Legs yellowish, apical half of hind femora and base of tibiae becoming blackish.

♂. Length 4.6 mm., width 1.9 mm. Head: width 1.02 mm., vertex .49 mm. Antennae: segment I, length .53 mm., blackish, paler on one side; II, 1.35 mm., black, paler beneath on basal half; III, .90 mm., yellowish; IV, .38 mm., pale. Pronotum: length .95 mm., width at base 1.75 mm. Very similar to the male in pubescence and coloration except the areas of black somewhat reduced; hind femora with two incomplete, subapical black annuli; membrane fuscous to blackish.

Holotype: ♂, July 19, 1926, Brownfield, Illinois (Vera G. Smith); author's collection. *Allotype:* same date as type. *Paratypes:* 4 ♂ 1 ♀, July 20, Urbana, Illinois: "on cottonwood."

Neoborus vittifrons n. sp.

Allied to *adustus* but distinguished by the narrower calli with black cephalic margins and the more closely punctate pronotal disk.

♂. Length 3.9 mm., width 1.6 mm. Head: width .98 mm., vertex .36 mm.; median line of and arcuate line around frons, and vertex except smooth spot next to the eye, with coarse closely set punctures, yellow; tylus and median line of frons blackish. Rostrum, length 1.12 mm., nearly attaining hind margins of middle coxae, yellowish, apex black. Antennae: segment I, length .34 mm., blackish, yellowish beneath; II, 1.06 mm.; III, .34 mm.; IV, (broken); black. Pronotum: length .82 mm., width at base 1.42 mm.; disk coarsely and closely punctate, more closely about calli than in *adustus,* also the calli narrower with cephalic margins black, more broadly black at inner angles; yellowish, basal half of disk more brownish, basal edge and collar white. Scutellum slightly convex, flat on apex, coarsely punctate; pale yellowish, basal half more brownish each side of median line.

Dorsum clothed with fine, short, sericeous pale pubescence. Color uniformly pale yellowish and tinged with brown; cuneus and outer half of corium yellowish translucent. Membrane pale, veins blackish, anal area and transverse mark behind apex of cuneus, fuscous; an opaque, pale callus bordering apex of larger areole. Legs pale to yellowish, knees and tips of tarsi fuscous.

♀. Length 4.2 mm., width 1 mm. Head: width 1.02 mm., vertex .49 mm. Antennae: segment I, length .34 mm., yellowish, blackish line above; II, .92 mm., yellowish brown to black, darker apically; III, .38 mm., black; IV, .34 mm., black. Pronotum: length .86 mm., width at base 1.6 mm. Very similar to the male in pubescence, puncturation, and coloration, but black marks on frons and calli frequently reduced to dark brown.

Holotype: ♂, April 26, 1926, Santa Catalina Mts., alt. 3,200 ft., Arizona (A. A. Nichol); author's collection. *Allotype:* same data as the type. *Paratypes:* 2 ♂ 2 ♀, taken with the types on *Fraxinus arizonicus* by Mr. Nichol. 10 ♂ ♀, April 19, 5 ♂ ♀, May 31, 2 ♂ 1 ♀, June 7, 1924, Tucson, Arizona (A. A. Nichol), taken on *Fraxinus arizonicus.* 2♂, July 20, 1917, Texas Pass, Arizona (H. H. Knight).

Neoborus vittifrons umbratus n. subsp.

Structurally very similar to *vittifrons* but the dorsum and body largely brownish black.

♂. Length 4.4 mm., width 1.7 mm. Head: width .99 mm., vertex .40 mm. Rostrum, length 1.09 mm., nearly attaining hind margins of middle coxae. Antennae: segment I, length .33 mm.; II, 1.03 mm.; III, .31 mm.; IV, .29 mm.; black, first segment brownish on one side. Pronotum: length .83 mm., width at base 1.51 mm.

Color dark brownish black, more black on basal half of pronotum and inner half of corium; each side of vertex bordering eye, arcuate spot each side of frons, and juga bordering tylus, yellowish; collar and basal edge of pronotum whitish, outer half of calli except cephalic edge and extending as a short ray just behind, narrow median line of disk, dorsal and ventral margins of propleura, yellowish; scutellum dark fuscous brown, narrow median line, apex, basal angles and extending along lateral margins, pale or whitish; hemelytra dark brownish black, an elongate area on outer half of corium, a similar area on middle of clavus, and the cuneus, yellowish translucent; cuneus becoming dark brownish bordering smaller areole. Membrane pale, anal area and veins fuscous; disk of larger areoles and spot behind cuneus, pale fuscous. Sternum, pleura, and sides of venter, dark brownish to black, genital segment dark brown. Legs pale to yellowish, femora with apical half dark brownish, biannulate with pale at apex; tibiae yellowish, a dark brown line at base on dorsal aspect, tips of tarsi fuscous.

Holotype: ♂, June 1, 1926, Chiricahua Mts., alt. 6,000 ft., Arizona (A. A. Nichol); author's collection. *Paratype:* ♂, taken with the type.

Neoborus rufivenosus n. sp.

Distinguished by the short rostrum, blackish hemelytra, yellow scutellum, reddish cuneus and red veins in the membrane.

♂. Length 4.7 mm., width 1.8 mm. Head: width .99 mm., vertex .415 mm.; reddish brown, frons yellowish, coarsely punctate on vertex, sides and median line of frons, a small smooth spot each side of vertex bordering the eye. Rostrum, length .98 mm., extending somewhat behind middle of sternum, yellowish, apex blackish. Antennae: segment I, length .45 mm., brownish black; II, 1.36 mm., brownish, becoming blackish apically; III, .45 mm., black; IV, (broken). Pronotum: length .87 mm., width at base 1.57 mm.; disk coarsely but not closely punctate; brownish black, collar and basal edge pale, calli yellowish and darkened more or less with brown, before and behind more yellowish. Scutellum yellow, rather coarsely and irregularly punctate.

Dorsum clothed with rather prominent, sericeous, whitish pubescence, longer and thicker on hemelytra. Hemelytra uniformly dark brownish black, with a tinge of red distally; cuneus pale translucent, becoming more or less pigmented with red. Membrane pale, veins red, anal area, disk of areoles, and transverse area behind cuneus, fuscous. Body beneath yellowish to dark brown, sides of sternum, pleura, sides of venter and genital segment becoming dark brown. Legs uniformly pale yellowish, tips of tarsi fuscous.

♂. Length 4.2 mm., width 2 mm. Head: width 1.03 mm., vertex .55 mm. Antennae: segment I, length .40 mm., yellowish; II, 1.09 mm., yellowish; III, .47 mm., fuscous; IV, .38 mm., fuscous. Pronotum: length .90 mm., width at base 1.66 mm. Very similar to the male in pubescence and punctuation, but coloration more uniformly yellowish;

dorsum yellowish to brown, subbasal area of pronotal disk and the pleura, dark brownish. Cuneus and veins only tinged with reddish.

Holotype: ♂, June 7–17, 1916, Jemez Springs, alt. 6,400 ft., Arizona (J. Woodgate); author's collection. *Allotype:* same data as the type. *Paratypes:* 18 ♂ ♀, taken with the types.

Neoborus fasciolus n. sp.

Allied to *vittifrons* but larger, distinguished by the black bands on tibiae and the uniformly yellowish frons.

♂. Length 4.7 mm., width 1.98 mm. Head: width 1.04 mm., vertex .445 mm.; yellow, distal half of tylus, basal half of juga and lora, and spot on dorsal margin of antennal socket, black. Rostrum, length 1.24 mm., reaching to near hind margins of middle coxae, yellowish, apex blackish. Antennae: segment I, length .39 mm., black; II, 1.15 mm.; III, .42 mm.; IV, .30 mm.; black. Pronotum: length .95 mm., width at base 1.67 mm.; coarsely punctate, basal margin more strongly sinuate near basal angles than at middle, lateral margins slightly sinuate, carina obsolete; brownish black, calli and anterior half of disk yellow, inner half of calli black. Scutellum very slightly convex, coarsely and rugosely punctate; yellow, a brown spot each side of middle.

Dorsum clothed with moderately prominent, sericeous, silvery white pubescence, shorter on scutellum and pronotum. Hemelytra rather uniformly brownish black, embolium and outer half of corium somewhat translucent; cuneus pale yellowish translucent, a fuscous spot on margin by apex of areole. Membrane pale, anal area fuscous, veins brownish to dusky; a pale fuscous area behind cuneus and within distal half of areoles. Venter blackish, margins of segments yellowish along middle third, basal half of genital segment yellowish. Pleura dark brown to black, sternum yellowish brown. Legs pale yellowish, femora with two incomplete subapical black bands; tibial knees black, with two interrupted black bands, one on middle and the other near base; apical segment of tarsi fuscous.

♀. Length 4.8 mm., width 2.2 mm. Head: width 1.08 mm., vertex .49 mm. Antennae: segment I, length .32 mm., yellowish brown, black above; II, 1.21 mm., black, more or less yellowish on basal half; III, .45 mm., black; IV, (broken). Pronotum: length .98 mm., width at base 1.85 mm. Very similar to the male in pubescence and coloration, but the dorsum becoming paler; however, the black on calli, head, and legs is equally distinct.

Holotype: ♂, April 27, 1915, Arboretum near cactus garden, Stanford University, California (Harold Morrison); author's collection. *Allotype:* same data as the type. *Paratypes:* 12 ♂ ♀, taken with the types.

Neoborus flaviceps n. sp.

Suggestive of *pacificus* Van D., but frons more convex and with a blackish line above on first antennal segment; differs from *fasciolus* in the more convex frons and the uniformly pale yellowish legs.

♂. Length 4.3 mm., width 1.8 mm. Head: width 1.03 mm., vertex .47 mm.; frons distinctly convex median line, sides, and middle of vertex with moderately coarse punctures. Rostrum, length 1.23 mm., reaching to near hind margins of middle coxae, yellowish, apex black. Antennae: segment I, length .40 mm., yellowish, with blackish line above; II, 1.21 mm., brown to fuscous, blackish apically; III, .38 mm., black; IV., .30 mm., black. Pronotum: length .90 mm., width at base 1.63 mm.; coarsely punctate, calli prominent; lateral margins slightly sulcate, slightly rounded and obsoletely carinate. Scutellum slightly convex, coarsely punctate.

Clothed with fine, short, yellowish pubescence, only slightly sericeous. Color uniformly yellowish, calli with black spot on inner angles, corium with a brownish cloud on apical field; cuneus, outer half of corium, and the embolium, yellowish translucent; collar and basal edge of pronotum whitish; scutellum whitish and tinged with yellow. Membrane pale fumate, veins scarcely darker but edges indicated by fuscous. Legs uniformly yellowish, tips of tarsi fuscous.

Holotype: ♂, June 1, 1926, Chiricahua Mts., alt. 6,000 ft., Arizona (A. A. Nichol); author's collection.

Neoborus amoenus floridanus n. subsp.

Differs from typical *amoenus* Reuter in the larger eyes, narrower vertex, and shorter rostrum; coloration suggestive of variety *scutellaris* Reut., but the structural characters mentioned will separate the forms.

♂. Length 4.4 mm., width 2.2 mm. Head: width 1.06 mm., vertex .32 mm., not equal to one-third the width of head; black, lower half of face pale, basal half of juga black. Rostrum, length 1.06 mm., not attaining hind margin of sternum, length just equal to width of head across eyes.

Antennae: segment I, length .66 mm., brownish; II, 1.57 mm., pale, apex black; III, .50 mm., pale; IV, (broken). Pronotum: length .95 mm., width at base 1.76 mm.; calli prominent, subconfluent, lateral carina of disk distinct, white; shining black, lower margin of the propleura pale. Scutellum convex, sparsely punctate, yellow, median line and basal margin black, mesoscutum also black.

Hemelytra black, spot near middle of corium, embolium, and cuneus, pale translucent; membrane and veins pale, anal area black. Ventral surface pale, pleura, sides of sternum, and obsoletely on sides of venter, blackish. Legs pale, apical fourth of hind femora reddish, tips of tarsi brownish.

Holotype: ♂, April 29, 1928, Ocala, Florida (E. D. Ball); author's collection.

Neoborus amoenus atriscutis n. var.

♂. Length 5 mm. Structurally very similar to typical *amoenus* Reut., but differs in the uniformly black color including the scutellum. Differs from *geminus* Say in the clear membrane, veins, and cuneus; anal area and basal angle of larger areole only infuscated.

Black, collar, obsolete dashes behind calli, frons except median line, antennae except apex of second segment, and the legs, pale; hind femora with subapical reddish band.

Holotype: ♂, July 13, 1924, Rainy River District, Ontario, Canada (J. F. Brimley); author's collection. *Paratypes:* 2 ♂, June 14, 1920, Ottawa, Ontario (J. McDunnough).

Xenoborus selectus n. sp.

Allied to *pettiti* Reuter, but differs in the narrower vertex and the longer second antennal segment which exceeds the width of pronotum at base; coloration suggestive of *neglectus* Kngt., but the genital claspers are more nearly the form of *pettiti*.

♂. Length 4.9 mm., width 2.2 mm. Head: width 1.12 mm., vertex .34 mm.; the width of vertex less than one-third the width of head. Rostrum, length 1.12 mm., not attaining hind margin of sternum, yellowish, apex blackish. Antennae: segment I, length .92 mm., black, pale at base; II, 1.98 mm.; III, .95 mm.; IV, .48 mm.; black. Pronotum: length .95 mm., width at base 1.72 mm.; calli prominent, subconfluent, lateral margins of disk slightly sulcate, rounded, ecarinate; coarsely punctate, scutellum with finer punctures.

Color pale to yellow with black; head yellowish, tylus and frons black; pronotum yellowish, a triangular black area each side on basal half of disk; scutellum yellow, mesoscutum fuscous; hemelytra black, cuneus, embolium, basal half of corium except bordering clavus and outer margin on apical field, clear to pale yellowish; membrane and veins fuscous black; venter and pleura blackish, sternum yellowish brown; legs pale yellowish, femora with two blackish subapical bands, tibiae and tarsi fuscous. Dorsum clothed with prominent, suberect, pale pubescence.

Holotype: ♂, May 30, 1916, Charleston, Missouri (E. H. Gibson); author's collection.

What Attraction?—From the Framingham sewage filter beds a small odoriferous stream runs between two hillocks on its way to the Sudbury River. Along this stream I found small piles of partly dried grass and weeds left by the workmen. Though it was October 12 the sun beat down his rays into this little valley with such fervor that I had removed both my coat and vest while shaking the piles of hay over my sifting cloth and picking up the numerous beetles that ran about in all directions. Presently I heard a humming about me but attributed it to large flies which are often attracted to sifting operations. Then I saw a small black moth alight on my white shirt, then another fluttered down to me, while a third flew around my head. After many attempts I managed to bottle two of the elusive but persistent little fellows and the third escaped; I saw no more during the three hours I was there. On comparison with the two specimens in the collection of the Boston Society of Natural History (one of which I took in Sherborn, Mass.) it proved to be *Pseudanaphora arcanella* Clem.—C. A. Frost, Framingham, Mass.

AN ABERRANT BUTTERFLY—JUNONIA COENIA.

By Wm. T. Davis, Staten Island, N. Y.

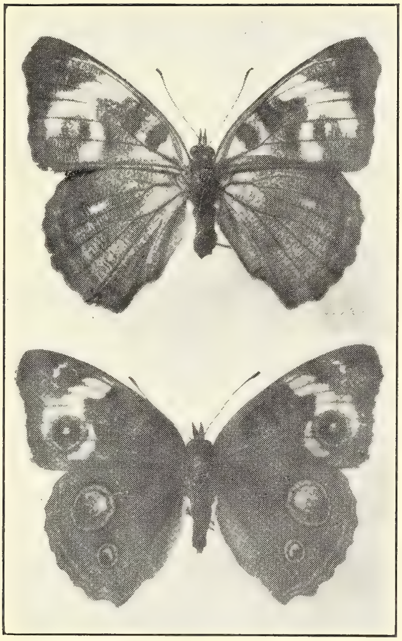
On August 13, 1927, while walking along the railroad near the home of Col. Wirt Robinson at Wingina, Va., I noticed a *Junonia coenia* that showed more white on the fore wings than usual. It was captured and I was then surprised to discover that the hind wings were without the usual eyed-spots. The specimen, which is here figured together with a normal individual, is a male, and the covering of scales on the wings is not as complete as usual.

Other interesting facts concerning *Junonia coenia* observed while at Wingina were the capture of a specimen by a house wren while it was flying near a building, also on August 13, and the finding of a sleeping individual while looking for insects with a lantern on August 15, with its wings tightly closed over its back, its head pointed downward and its antennae held straight out.

While this butterfly is often quite common in open places as far north as Staten Island, how it spends the winter is not surely known. In parts of the South it is active or hibernates during the winter and probably all of the Staten Island and Long Island specimens in the spring have come from the South.

In the Bulletin of the Southern California Academy of Sciences for 1926, pp. 77–82 there is a paper on "Inbreeding of *Junonia Coenia* through Thirty-five Successive Generations," by Wilhelm Schrader, where much information about the species is recorded, and illustrations given of some variations in bred individuals.

Information Wanted.—What is the food plant of *Oberea schaumi* Lec.? My only record for the capture of this species was made on July 31, 1916, when I removed a fine specimen from the helmet of one of Framingham's " Finest " as he stood on the curb and majestically surveyed the scenery. He looked at me a moment with obvious pity in his eyes but allowed me to escape with my prize.—C. A. Frost, Framingham, Mass.



Junonia coenia from Virginia.

PEDILUS PARVICOLLIS NOT A DENDROIDES.

By H. C. Fall, Tyngsboro, Mass.

In the December, 1928, number of this Journal, p. 260, Dr. Van Dyke states his conviction that my *Pedilus parvicollis* is a *Dendroides,* as evidenced by the shape of the head, prothorax, and elytral features, and that the generic and family characters are those of the latter genus and not of *Pedilus.*

I have been aware for some time of this particular obsession of the Doctor's and he and I in a friendly way have threshed it over at some length in correspondence.

Let it be granted at once that *P. parvicollis* is not a typical *Pedilus.* The flabellate male antennae, the narrowing of the head immediately behind the eyes, the smaller somewhat differently shaped thorax and a certain lankiness of form give it an appreciably different appearance. It must be remembered, however, that there are other aberrant species within the genus *Pedilus.* First to break the uniformity came *P. crotchi* with its pectinate male antennae though otherwise typical in aspect. Somewhat later Horn described *P. flabellatus.* In this there is a further divergence from the usual type in that the antennae are truly flabellate, the thorax is smaller and of modified form, and the tempora are distinctly shorter, less prominent and a little oblique. Now *parvicollis* is practically identical with *flabellatus* in antennal formation, and in shape of thorax agrees even better with the latter than it does with *Dendroides.* Because of the lack of tempora the shape of the head in *parvicollis* is much the same as in *Dendroides* but here the head resemblance ends; the extremely large eyes, nearly or quite contiguous in the males, and the very long flexible branches of the plumose antennae, both characteristic features of *Dendroides,* are wholly unlike those of *P. parvicollis.*

I cannot agree with Dr. Van Dyke that the generic and family characters of *P. parvicollis* are those of *Dendroides* rather than *Pedilus.* As a matter of fact there is no appreciable error in saying that reliable differences of family rank between *Dendroides* and *Pedilus* are non-existent. LeConte and Horn in their family diagnoses give only a single distinguishing character, *viz.,* the greater prominence of the hind coxae in the Pyrochroidae as compared with the Anthicidae, in which family they included *Pedilus.* Without going into details I wish to assert that so far as

Pedilus is concerned the character is for several reasons a fallacious one and is so little impressive that in the standard European Catalogue of Heyden, Reitter and Weise, *Dendroides* and *Pedilus* are placed close together in the same family, the Pyrochroidae.

The consideration of subordinate or generic characters shows fairly clearly that *parvicollis* has diverged from typical *Pedilus* in the direction of *Dendroides,* but that as indicated above it is certainly still nearer to *flabellatus* (an accepted *Pedilus*) than to any *Dendroides.* Furthermore, the male genitalia of *parvicollis* show a closer relationship with *Pedilus* than with *Dendroides.* A new genus might with reason be erected for *parvicollis,* but in that case one must decide what to do with *P. flabellatus.* In any case *parvicollis* is emphatically not a *Dendroides.*

Rare Beetle, Rarer Luck.—*Strangalia* (*Leptura*) *deleta* Lec. is a species rarely taken in spite of the saying, " no species is rare if you know where to look for it." I certainly know that I have found specimens on a certain bunch of *Spiraea* flowers in a meadow by a brook in Sherborn near a fine grove of white pines in August on several different years. I make it a point to visit this bush and all the others along the thousand feet of meadow several times during the summer but it has been many years since I took the last specimen. One was taken in Wareham, Mass., on *Solidago* flowers on August 21, 1921, and I have seen one specimen in the collection of Mr. E. J. Smith of that town; I have also seen it from Isle of Springs, Me., and another locality in that state. I have found that the species was not represented in many of the collections of the country to which fact my two lonesome specimens bear witness. So much for its rarity.

One day in late summer I was collecting (mostly *Hymenoptera*) on some late *Ceanothus* flowers that still showed their white heads amid their dead and brown companions, when I dropped my open cyanide jar. What I said as it landed bottom up amid the thick bushes has no place on this page. On all fours I sought to salvage the scattered insects and the first thing I saw was the perfectly preserved and dried body of a fine male *deleta* lying right beside my jar.—C. A. Frost, Framingham, Mass.

EDITING, EDITORS, CONTRIBUTORS AND READERS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

The life of an editor is full of problems, particularly if he is an entomological editor. Contributors, being a more privileged class, are alien to these problems; and readers see only the finished product, which appeals—or doesn't.

To writers, an editor seems to be a cross between the Judge in the black cap, the executioner with his sharp axe of office, and the Old Boy Himself! Well, they are wrong: the editor is a compound of the fellow in the dock, the gentleman with his head on the block, and the damned on the grill.

And here is how it is. All editors have one problem: to appeal to their readers. But this problem is extremely acute with editors of special and technical publications, whose constituency of readers is necessarily limited to the members of the esoteric brotherhood to whom their journals appeal. And here it is that editors must exercise judgment in selecting what will appeal to their readers. It must not only be of the nature called for by the readers, but it must also conform with the general policy of the journal. This publication—the Bulletin of the Brooklyn Entomological Society—for instance, is specifically for the publication of articles on insects, but, above all, these articles cannot be popular in the ordinary sense of many fancy words about nothing—and mostly wrong where they deal with facts, at that. Our articles have to be of scientific value, even though they be but brief, non-technical notes. Then, again, they must refer to North American insects principally, preference being given to the insects of New York, and particularly of Long Island. Of course, *good* articles are never rejected, if there is room available for them.

Once these conditions are met, the editor must consider just how much space to allot to any particular group and how promptly an article should appear. And here the editor is tied down by what he receives and by space limitations, which will be referred to further on.

As a general rule, this journal does not wish, as a matter of general policy, to allot space to descriptions of varieties, forms or aberrations, except if they come in the general discussion of the species of a group. Our fauna does not seem to us to be sufficiently well worked (as the European fauna is), to make desirable such taxonomic refinements without ample supporting data.

When articles are accepted for publication, then comes the live question of the proper balance to be preserved in the publication; and the order in which to arrange such articles as are to appear. Here, policy and space limitations rule about equally. A leading article imposes itself by its length or by its importance, which generally go together. Other articles are placed partly according to space and partly so as to vary the contents of any given number. Our general desire is to preserve (if we can), a balance between the highly technical and special and the simpler and more general articles. But we have to publish what we get. If our journal at times seems too abundant in technical and heavy matter, it is because we have no other.

One policy the BULLETIN has rigidly adhered to; and the present management is little likely to depart from it. That policy is the publication of articles exactly as received from the authors, with no other change or correction than obvious errors of typing or of punctuation. We go on the principle that an author knows what he wants to say better than we or any other more heaven-inspired editor. And we do not propose to improve on an article or change it in any way. If an article appears on the face of it to be erroneous, we simply do not publish it; if some change might make it available, we put the making of the change up to the author. But all articles represent the views and manner of presentation of the author (including this one), and in no way represent editorial opinion. Hence, the responsibility for all statements appearing in our two publications lies exclusively with the authors. Of course, while controversial articles may be published by us, neither this journal nor any other journal, can give publicity and circulation to personal attacks impugning the motives or the character of any one. " It isn't cricket," or—more properly—it is not scientific. On the other hand, every writer who presents his views to the public must expect some kind of a reaction to them; and just as he gladly welcomes warm praise, so should he philosophically accept cold criticism and adverse comment. After all, the ultimate goal of all scientific workers is fact and truth. What is true on to-day's known facts, tomorrow may be shown to be romance, in the presence of later factual knowledge. And all should be prepared for and welcome that eternal change which is life. But it is not necessary to establish or promote this flow of ideas by vituperation or dubious personal remarks.

Having thus far set forth certain principles which lie at the base of all class publications, such as are the entomological journals, let us consider now the mechanical side of editing.

At the very start, an editor must first read an article to appraise it according to the standards of his publication. That first step being successfully surmounted by an article, it is then scanned for such corrections as may be required from the purely mechanical side and marked for setting up by the printer—or, rather, compositor.

All publications have a set style of make up, partly from mechanical, partly from artistic, partly from editorial considerations of one kind or another. At the very start, the size of the page of each journal is fixed—that is to say, its length and width are standard. Next in order is the size and style of type, which governs the number of lines to the page when set up. Once the style and size of type are determined upon, they are never varied. Hence, it is a waste of labor for authors to indicate such details on the MSS. If they agree with the publication's style, well and good, but unnecessary; if they differ, the editor simply runs the famous blue-pencil through them and marks the articles up in the standard form. The style of type (and the size) are ruled by legibility, economy of space and cost. Most journals are printed in 10-point type, generally with lines spaced far apart, which is very wasteful of space and comparatively uneconomical. Printing experience and practice show that 10-point type on 11-point body is by far the most economical of space while extremely legible. The small size type frequently seen in journals is 8-point. This is not only expensive, but also hard to read—a very bad size for journals which have to be conned intensely in use. Another matter is the arrangement of headings, new species, species named in the body of an article, etc. Here the editor has again to be ruled by practical considerations. New species *must* stand out, so we employ **bold face** type of the same size as the body type. Species in the text must also be indicated, largely for the benefit of indexers (including the editor) and of abstractors, as well as to make them more evident to the general reader.

Paragraphs and section heads must also be indicated, as well as the indentation of lines or paragraphs or sections, to set them off noticeably.

These all being done, the MS goes to the printer to be set up as indicated in the MS, which now has the name of copy. Printers are bound to follow copy, out of the window if necessary, as they put it in their quaint dialect. Therefore, every punctuation mark, every capital, every paragraph, every spelling, right or wrong, comes back to the editor as it was in the copy, in the first proof, or galley so-called. Here the editor (if he can) catches some more errors of typography or what-not, and corrects them. If the editor has not been keenly on the job, he has to rephrase sentences and paragraphs; he adds here, he takes out there; and then returns the corrected galley proof to the printer for further correction. This particular editor, being wary, makes no changes in the matter—they cost money, at the rate of $2.50 per hour for resetting and rearranging. And all these author's corrections, so-called, *always* take hours and hours and *hours.* It is relatively easy to spend on a small 40 to 50 page magazine from $15 to $20 for such corrections. Our own practice is to send first galley proof to our authors; and if they are tempted to improve on what is already in type, they may to their heart's content, provided they are willing to pay the printer's extra charge for the work. It is a very helpful practice to have authors read the galley proofs of their articles. It not only enables them to catch any errors in the article itself—more likely than not in matters beyond the editor's omniscience—but it also acts as a check on typographical errors. And further, it affords authors an opportunity to unburden themselves of anything not to their liking in the article as set up; and it also commits them irrevocably to it in final form. This is altogether a reciprocally and mutually profitable arrangement from every point of view.

The final galley proof being corrected, it is now cut up suitably into pages; the pages assembled and numbered consecutively; and a table of contents for the number prepared. It goes again to the printer in this shape. He cuts up the type matter into pages; places the figures, if any; puts the running head—the name of the journal, date and issue—at the top of each page; and before locking up and starting to print he draws off *page* proofs. These go to the editor with the dummy, as the first arrangement of the cut up galleys is called. The editor then checks up with the dummy to see that all corrections and changes are incorporated in the page proof. Then, if he is wise, he very carefully rereads the page proof to see that no errors have crept in during the manipulations of making the galley type into pages. And finally, the whole make up and general appearance of the number in hand is gone over. In these processes, all changes and corrections have been noted on the pages as they are checked up; and the page proof with all these notations once more travels to the printer. Some editors call for a second corrected page proof and o.k. on that for printing. Where the printer is reliable and habituated to the magazine, such a corrected proof is time-wasting and unnecessary. The capable proof-readers in the printing establishment can, and do, check back page proofs. Thus, the editor may give the order to print, on approval of only one—the first—set of page proofs, with the assurance that the magazine will appear in good form and in good time.

Magazines are most economically printed in multiples of 16 pages, technically called a form, which explains why journals run 16, 32, 48, 64, and so on, pages to the number. The necessary handling and running of the presses is the same for all forms under 16 pages, so this handling makes the page price higher the smaller the form, quite a consideration in non-profitable technical journals such as ours.

And all these details being settled well and carefully, the presses start and soon the edition is ready for the folder, the binder, the trimmer and the mailer. Very soon readers have it in their hands; and authors wonder what made them say such nonsense, and lay it, of course, to the editor. And he, if careful, points to the galley proof with the author's own corrections on it; and says nothing.

The general reader further notices how few are the articles on Coleoptera, how unimportant the lepidopterological remarks. But, ah! how full the pages on *Ctenopsylla cheopis;* or on the inwards of dipterous taxonomy! Very unseemly and, of course, very poor editing.

And here we are, back again where we started from, like the symbolic snake, ever swallowing its tail and never quite succeeding in getting a full meal, but rolling along like a hoop over the bumps.

And so it may readily be seen that not only do editors get what they deserve, but that they likewise deserve what they get, in full measure, brimming over, darn 'em!

All authors should serve a penal term as editors, then they'll be less inclined to let stark justice take its course with and among editors.

We offer our gratitude in conclusion, to all faithful readers who have followed us, profitably, we hope, to this bitter end.

NOTES ON NORTH AMERICAN LEPIDOPTERA.

By F. H. Chermock, Pittsburgh, Pa.

Plebeus lupini ab. **immaculata** ab. nov.

This aberration is like the typical *lupini* except that it lacks all markings on the lower surface of the secondaries, but has the usual row of marginal spots. The submarginal row is totally obliterated.

Holotype, July 14, 1921; Topoparatype, July 14, 1921; Gold Lake district, Sierra Co., Calif.

This aberration resembles *P. acmon* var. *cotteli* ab. *labecula* and bears the same relationship to *lupini* as *labecula* does to *cotteli.* I have several transitional specimens of *lupini* to *immaculata,* but do not consider them worthy of a name.

Glaucopsyche xerces var. **intermedia** var. nov.

This variety is probably the connecting link between *G. xerces* and its forms. *G. xerces* has the spots on the undersurface solid white, while all of its forms and aberrations have white spots with black centers, in some cases the white almost lacking. This new variety does not differ much from *polyphemus* as to size of markings except that the two spots in the discal area are fused into one elongate white marking. The other spots differ in that they are white and have the centers the same color as the general ground color of the wings below. The ground color is the same and typical *G. xerces.*

Holotype, March 17, 1926; Allotype, March 21, 1925; Lone Mountain, San Francisco, Calif.

I have had in my possession about 200 specimens of *G. xerces* and varieties and forms and I am of the opinion that this variety is the connecting link, therefore I call it *'intermedia.'*

Fentonia marthesia ab. **nigra.**, ab. nov.

This aberration is the same as typical *F. marthesia,* except that the primaries are totally black above. The secondaries have a broad black marginal band, with white fringe above. The entire underside of both wings is darker than normal specimens. The thorax is a dark olive green, the body black above, below normal.

Holotype, August 15, 1924; Pittsburgh, Pa.

I reared this aberration along with several typical specimens.

Cercyonis (*Satyrus*) *pegala* race **borealis.**

This race is like typical *pegala* except that it almost totally lacks the yellow patch on the primaries above. Below the patch is restricted to rings around the spots.

The male has one spot on the primaries which will facilitate the separating of it from its close ally. *S. alope* var. *nephele* is much smaller than *borealis.*

Holotype, VII–10–1920; Allotype, VII–4–1920; Trumball Co., Ohio.

Eurymus eurytheme f. *eriphyle* var. **nigricosta, var. nov.**

This variation of *eriphyle* occurs in the female sex only. It is the same as typical *eriphyle,* except that the yellow spots in the marginal band are lacking in both wings. It bears the same relationship to eriphyle as *plicaudula* does to philodice.

Holotype, VIII–1–1924; Topoparatype, VIII–1–1924; Edmondton, Alberta, Canada.

Eurymus eurytheme f. *eriphyle* ab. **laurae.**

This fine aberration is the same as typical *eriphyle* female, except that the yellow is replaced by white. The secondaries above are clouded with black.

I took this specimen with a male of typical *eriphyle* and considered it a very unusual capture.

Holotype, VIII–1–1924; Edmondton, Alberta, Canada.

Eurymus philodice var. **serrata.**

This peculiar variation which occurs in the male sex only, as far as I can see, differs from typical *philodice* in that the inner margin of the marginal band is serrate or dentate. These teeth-like markings occur between the veins. Out of at least two or three thousand specimens I have taken about eight or nine of this variety. At present I have six, all collected at Rossgrove, near Aspinwall, Pa. This locality is noted for peculiar specimens due to its very odd topography. There are arid spots and swamps in this bowl and this probably accounts for the unusual specimens.

Holotype, VIII–8–1926; paratypes, No. 1, VIII–8–1926; Nos. 2, 3, 4, VIII–10–1926; No. 5, VIII–12–1926; Rossgrove, near Aspinwall, Pa.

THE CRANE-FLIES OF NEW YORK: THIRD SUPPLEMENTARY LIST.

By Charles P. Alexander, Amherst, Mass.

The preliminary list of crane-flies, including the families Tanyderidae, Ptychopteridae, Trichoceridae, Anisopodidae and Tipulidae, totalled 267 species.[1] The first supplementary list[2] brought this number to 277 species. The second supplementary list[3] added five species, bringing the total number to 282. In the accompanying list, 24 additional species are recorded, bringing the total number of species to 306, of which 295 belong to the family Tipulidae. A few of the species recorded at this time were included in the New York list[4] but the majority have not before been recorded from the State.

The additions to the list of New York crane-flies are as follows:

283 *Tipula angulata* Loew.
Essex County: Foot of Hurricane Mt., June 12, 1927 (C. P. Alexander).

284 *Tipula entomophthorae* Alexander.
Essex County: Wilmington Notch, June 13, 1927 (C. P. Alexander).

285 *Tipula platymera* Walker (=*labradorica* Alexander).
Essex County: Mt. Skylight, 4800–4920 feet, July 22, 1920.

286 *Tipula septentrionalis* Loew.
Warren County: Warrensburg, June 11, 1927 (C. P. Alexander).

287 *Limonia* (*Limonia*) *hudsonica* Osten Sacken.
Warren County: Warrensburg, June 11, 1927 (C. P. Alexander).

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[1] Alexander, C. P. The crane-flies of New York. Part I. Cornell University, Agr. Expt. Sta. Mem. 25: 787–826; 1919.

[2] Alexander, C. P. The crane-flies of New York: First supplementary list. Bull. Brooklyn Ent. Soc., 17: 58–62; 1922.

[3] Alexander, C. P. The crane-flies of New York; Second supplementary list. Bull. Brooklyn Ent. Soc., 19: 57–64; 1924.

[4] Leonard, M. D. A list of the insects of New York. Cornell University, Agr. Expt. Sta. Mem. 101: 688–701; 1928.

288 *Limonia* (*Limonia*) *novae-angliae* Alexander.
Orange County: Tuxedo Park, August 27–28, 1928 (F. W. Edwards).

289 *Limonia* (*Dicranomyia*) *profunda* Alexander.
Fulton County: Sphagnum bog, near Canada Lake, 1700 feet, June 25, 1928 (C. P. Alexander).

290 *Limonia* (*Dicranomyia*) *sphagnicola* Alexander.
Fulton County: Gloversville, 900 feet, June 24, 1916, June 27, 1928 (C. P. Alexander).

291 *Limonia* (*Dicranomyia*) *uliginosa* sp. n.
Hamilton County: Lake Pleasant, 1750 feet, in sphagnum bog, June 18–20, 1926 (C. P. Alexander).

292 *Dicranoptycha elsa* sp. n.
Cattaraugus County: Tunesassa, August 19, 1926 (W. P. Alexander).

293 *Dicranota currani* Alexander.
Essex County: Keene Valley, May 26, 1920 (H. Notman).

294 *Limnophila harperi* Alexander.
Essex County: Summit of Hurricane Mt., June 12, 1927 (C. P. Alexander).

This interesting crane-fly was described from Alberta and its occurrence in New York is of exceptional interest. The flies were found on the western side of the mountain, close to the summit, where there are low cliffs continually moist with dripping water. They rest on these exposures, quite in the manner of *Dactylolabis montana.* Several pairs were in copula, resting end-to-end on the vertical rock faces, the wings of both sexes outspread. Detached males are very active.

295 *Limnophila* (*Ephelia*) *solstitialis* Alexander.
Chenango County: Lower Cincinnatus, July 21, 1916 (C. P. Alexander).
Cortland County: Taylor, July 20, 1916 (C. P. Alexander).
Fulton County: Mountain Lake, 1550 feet, June 15–July 7, 1914 (C. P. Alexander).
Hamilton County: Wells, July 29 (D. B. Young).

296 *Limnophila* (*Phylidorea*) *auripennis* Alexander.
Essex County: Keene Valley, August 20, 1920 (H. Notman).
Rensselaer County: Brookview, June, 1923 (C. P. Alexander).

Tompkins County: Fall Creek, Ithaca, May 29, 1916 (C. P. Alexander).

297 *Limnophila* (*Phylidorea*) *caudifera* Alexander.
Hamilton County: Lake Pleasant, 1750 feet, June 17–21, 1926 (C. P. Alexander).

298 *Limnophila* (*Phylidorea*) *fumidicosta* Alexander.
Tompkins County: Bools Backwater, Ithaca, June 13, 1917 (C. P. Alexander).

299 *Limnophila* (*Phylidorea*) *luteola* Alexander.
Hamilton County: Lake Pleasant, 1800 feet, in *Iris* swamp, June 18–21, 1926 (C. P. Alexander).

300 *Limnophila* (*Phylidorea*) *neadusta* Alexander.
Essex County: Keene Valley, July 14, 1920 (H. Notman).

301 *Limnophila* (*Phylidorea*) *platyphallus* Alexander.
Fulton County: Masten's Woods, Gloversville, 900 feet, June 12, 1926 (C. P. Alexander).
Hamilton County: Lake Pleasant, 1700 feet, June 17–20, 1926 (C. P. Alexander).

302 *Gonomyia* (*Gonomyia*) *bidentata* Alexander.
Fulton County: Sacandaga Park, August 28, 1925 (C. P. Alexander); Masten's Woods, Gloversville, 900 feet, August 31, 1925 (C. P. Alexander).
Essex County: Ausable Chasm, August 15, 1925 (G. C. Crampton).

303 *Gonomyia* (*Gonomyia*) *currani* Alexander.
Rensselaer County: Brookview, June 25, 1923 (C. P. Alexander).

The wings are more strongly suffused with yellow, with an evident stigma, and there are slight differences in the structure of the apex of the aedeagus, but still insufficient to separate the present material from typical *currani*.

304 *Erioptera* (*Erioptera*) *ebenina* Alexander.
Fulton County: Masten's Woods, Gloversville, 900 feet, June 16, 1924 (C. P. Alexander); same locality, June 27, 1928 (C. P. Alexander).

305 *Ormosia ithacana* sp. n.
Tompkins County: Ithaca, April 26–May 5, 1913 (C. P. Alexander).

306 *Ormosia luteola* Dietz.
Fulton County: Masten's Woods, Gloversville, 900 feet, August 31–September 1, 1925 (C. P. Alexander).

CRANE-FLIES TAKEN AT LAKE PLEASANT, HAMILTON COUNTY, NEW YORK, JUNE 17–23, 1926, BY C. P. AND M. M. ALEXANDER

The following record of Tipulidae that were secured at Lake Pleasant in June is given as a contribution to our scanty knowledge of the insects of the southern Adirondacks. Most of the species were secured near the lake, altitude 1700 feet, a few, indicated in the list by the words, "Hamilton Mt." being from the slopes of Hamilton Mt., a few miles from the lake, on June 19th.

Tipula (*Trichotipula*) *oropezoides* Johnson.
Tipula dorsimacula Walker (= *angustipennis* Loew).
Tipula caloptera Loew.
Tipula cayuga Alexander.
Tipula hermannia Alexander.
Tipula hinei Alexander, Hamilton Mt., 2,500 feet.
Tipula iroquois Alexander, Hamilton Mt., 2,500 feet.
Tipula monticola Alexander.
Tipula penobscot Alexander, Hamilton Mt., 2,500 feet.
Tipula senega Alexander.
Tipula serta Loew.
Tipula strepens Loew.
Tipula tephrocephala Loew.
Tipula trivittata Say (= *simulata* Walker).
Nephrotoma euceroides Alexander.
Nephrotoma ferruginea (Fabricius).
Nephrotoma incurva (Loew).
Nephrotoma lugens (Loew).
Dolichopeza americana Needham.
Oropeza venosa Johnson.
Liogma nodicornis (Osten Sacken).
Phalacrocera tipulina Osten Sacken.
Limonia (*Limonia*) *indigena* (Osten Sacken).
Limonia (*Limonia*) *pubipennis* (Osten Sacken).
Limonia (*Limonia*) *triocellata* (Osten Sacken).
Limonia (*Rhipidia*) *fidelis* (Osten Sacken).
Limonia (*Dicranomyia*) *liberta* (Osten Sacken).
Limonia (*Dicranomyia*) *longipennis* (Schummel).
Limonia (*Dicranomyia*) *pudica* (Osten Sacken).
Limonia (*Dicranomyia*) *uliginosa* sp. n.

Limonia (*Geranomyia*) *canadensis* (Westwood).
Limonia (*Geranomyia*) *rostrata* (Say).
Helius flavipes (Macquart).
Tricyphona calcar (Osten Sacken).
Tricyphona inconstans (Osten Sacken).
Tricyphona paludicola Alexander.
Tricyphona vernalis (Osten Sacken).
Amalopina flaveola (Osten Sacken).
Rhaphidolabis (*Plectromyia*) *confusa* Alexander.
Rhaphidolabis (*Rhaphidolabis*) *tenuipes* Osten Sacken.
Adelphomyia minuta Alexander.
Ula paupera Osten Sacken.
Epiphragma fascipennis (Say).
Dactylolabis montana (Osten Sacken).
Pseudolimnophila inornata (Osten Sacken).
Pseudolimnophila toxoneura (Osten Sacken).
Limnophila (*Lasiomastix*) *macrocera* (Say).
Limnophila (*Lasiomastix*) *tenuicornis* Osten Sacken.
Limnophila (*Phylidorea*) *adusta* Osten Sacken.
Limnophila (*Phylidorea*) *caudifera* Alexander.
Limnophila (*Phylidorea*) *lutea* Doane.
Limnophila (*Phylidorea*) *luteola* Alexander.
Limnophila (*Phylidorea*) *platyphallus* Alexander.
Limnophila (*Prionolabis*) *rufibasis* Osten Sacken.
Limnophila (*Dicranophragma*) *fuscovaria* Osten Sacken.
Limnophila areolata Osten Sacken.
Limnophila brevifurca Osten Sacken.
Limnophila subcostata Alexander.
Pilaria quadrata (Osten Sacken).
Pilaria recondita (Osten Sacken).
Pilaria stanwoodae (Alexander); very abundant in bogs.
Shannonomyia lenta (Osten Sacken).
Eriocera cinerea Alexander.
Elephantomyia westwoodi Osten Sacken.
Gonomyia (*Gonomyia*) *subcinerea* (Osten Sacken).
Gonomyia (*Gonomyia*) *sulphurella* (Osten Sacken).
Helobia hybrida (Meigen).
Ormosia dentifera Alexander, Hamilton Mt., 2,500–3,000 feet.
Ormosia deviata Dietz.
Ormosia mesocera Alexander, Hamilton Mt., 2,200 feet.
Ormosia nigripila (Osten Sacken).

Ormosa nubila (Osten Sacken).
Erioptera (*Erioptera*) *septemtrionis* Osten Sacken.
Erioptera (*Erioptera*) *vespertina* Osten Sacken.
Erioptera (*Hoplolabis*) *armata* Osten Sacken.
Erioptera (*Mesocyphona*) *caloptera* (Say).
Erioptera (*Mesocyphona*) *needhami* Alexander.
Erioptera (*Empeda*) *stigmatica* (Osten Sacken).
Erioptera (*Gonempeda*) *nyctops* Alexander, very abundant.
Molophilus forcipulus (Osten Sacken).
Molophilus hirtipennis (Osten Sacken).
Molophilus pubipennis (Osten Sacken).

Limonia (Dicranomyia) uliginosa sp. n.

General coloration gray, the praescutum with four narrow brown stripes; antennae dark throughout; halteres of moderate length, yellow, the knobs brown; wings with a faint brownish tinge, the stigma large; male hypopygium with the lobes of the ninth tergite conspicuous, darkened, setiferous.

Male.—Length about 5.5 mm.; wing, 6.2 mm.

Female.—Length about 7.5 mm.; wing, 8 mm.

Rostrum dark reddish brown; palpi dark brown. Antennae dark throughout; basal flagellar segments subglobular, the outer segments passing into oval. Head dark brownish gray, the center of the vertex broadly darker brown.

Pronotum gray. Mesonotal praescutum brownish gray, with four narrow brown stripes, the long intermediate pair almost confluent, the lateral pair less distinct, the lateral margins of the sclerite clearer gray; scutum, scutellum and postnotum dark, heavily gray pruinose. Pleura clear light gray. Halteres of moderate length, yellow, the knobs dark brown. Legs with the fore and middle coxae dark brown, the posterior coxae paler; trochanters testaceous yellow; legs long, the femora obscure brownish yellow, brighter basally, the tips rather narrowly dark brown; tibiae pale brown, the tips narrowly brownish black; tarsi brownish black. Wings with a faint brown tinge, the stigma large, darker brown; a brown seam along vein Cu_1, chiefly in cell M; veins dark brown, the prearcular region more yellowish. Venation: Sc relatively short, Sc_1 ending shortly beyond the origin of Rs, Sc_2 shortly before this origin, Sc_1 alone being more than one-half *m-cu*; Rs a little less than twice the length of the basal deflection of R_{4+5}; cell *1st* M_2 closed, relatively large, its inner end more or less arcuated, the veins issuing from it relatively short, the longest about equal to the cell; *m-cu* close to the fork of M.

Abdomen dark brown, sparsely pruinose, the hypopygium somewhat brighter. Male hypopygium with the ninth tergite large and conspicuous, each lateral lobe darkened, rounded and densely setiferous. Basistyle relatively short and stout, the ventro-mesal lobe stout, terminating in a truncated lobe that bears three conspicuous curved setae. Dorsal dististyle a short powerful, strongly curved rod, the tip narrowed into an acute blackened spine. Ventral dististyle a large fleshy lobe, the rostral prolongation relatively short and stout, the two spines slightly unequal, the inner being a little longer, the distance between the two less than one-fourth the length of the shortest; tip of prolongation beyond the spines relatively short, less than the length of the shortest spine.

Habitat: New York and New England.

Holotype, ♂, Lake Pleasant, Hamilton Co., New York, in a sphagnum bog, altitude 1,750 feet, June 20, 1926 (C. P. Alexander).

Allotopotype, ♀, June 18, 1926.

Paratypes, 2 ♀♀, Foot of Mt. Mansfield, Vermont, near Stowe, in a sphagnum bog, altitude 1,000 feet, June 22–24, 1927 (C. P. Alexander). Types in the author's collection.

In its general appearance, *L. uliginosa* most closely resembles *L. liberta* (Osten Sacken) but is a very different fly.

The types were taken in association with other characteristic bog-inhabiting crane-flies, as *Phalacrocera tipulina* Osten Sacken, *Pilaria stanwoodae* (Alexander) and others.

Dicranoptycha elsa sp. n.

Male.—Length about 9 mm.; wing, 9 mm.

Female.—Length about 10 mm.; wing, 9.5 mm.

Described from alcoholic specimens.

Allied to *D. septemtrionis* Alexander in the short costal fringe of the male and general coloration and venation, differing conspicuously in the structure of the male hypopygium, which is unlike any of the rather numerous species now known to occur in Eastern North America.

Wings with cell *1st* M_2 relatively very long and narrow, *Rs* being correspondingly reduced; *m-cu* at from one-third to one-half the length of cell *1st* M_2. Male hypopygium with the two dististyles united basally, the outer relatively slender, narrow, terminating in a long acute blackened spine; distal half of the style roughened on all surfaces, on the outer face these roughenings taking the form of acute appressed spines;

basal half of style with short erect setae. Inner style broad at base, angularly bent, the distal half with long conspicuous setae, the expanded basal half with only a few setae. Lateral process pale, narrowed near midlength, the outer end a little expanded, the tip truncated. Aedeagus small, subtended by large flattened blades of entirely distinct form from that of *D. sobrina* Osten Sacken or *D. megaphallus* Alexander; apex of structure deeply split by an acute V-shaped notch, the lateral blades very extensive, their edges nearly hyaline.

Habitat: New York.

Holotype, alcoholic male, Tunesassa, Cattaraugus Co., August 19, 1926 (W. P. Alexander).

Allotopotype, ♀.

Types in the author's collection.

I take great pleasure in naming this crane-fly in honor of Mrs. Elsa Müller Alexander. There is a bare possibility that the present fly may represent *D. sororcula* Osten Sacken, a name that was sunk by Osten Sacken in the synonymy of *sobrina*.

Ormosia ithacana sp. n.

Male.—Length about 3.8–4.2 mm.; wing, 5–5.5 mm.

Very closely allied to *O. meigenii* (Osten Sacken), from which it differs chiefly in the details of structure of the male hypopygium. Flagellar segments a trifle longer. General coloration dark gray, the lateral pretergites light yellow. Legs longer, especially the posterior femora and tibiae. Wings with the pattern paler. Venation: Veins R_3 and R_4 with their tips directed slightly cephalad, especially the former; *m-cu* some distance before the fork of *M*. Male hypopygium with the inner dististyle a broadly dilated blade, the apex suddenly narrowed into an acute black spine that lies in the plane of the longitudinal axis of the style; in some specimens, a second spine on outer margin of style near midlength of the blade. Longest gonapophysis with the base widely dilated, the tip directed strongly laterad. Shorter gonapophysis sinuous, gradually narrowed to the slender acute apex, the outer margin before the apex with a few microscopic denticles. The laterally expanded bases of the longer gonapophyses are very conspicuous.

Habitat: New York.

Holotype, ♂, Ithaca, May 3, 1913 (C. P. Alexander).

Paratopotypes, 2 ♂♂, April 26–May 5, 1913 (C. P. Alexander).

Types in the author's collection.

PROTECTIVE ADAPTATIONS AMONG AQUATIC HEMIPTERA.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Size, form, color, position and behavior are closely linked with the other three protective adaptations among the waterbugs; in fact color at times depends on behavior for its protective efficacy.

The Aquatic Hemiptera naturally divide themselves into the two empirical groups—Cryptocerata and Gymnocerata. The latter may be dismissed briefly as they do not appear to any great extent as prey, but preeminently as predators. Their size, habits and great agility are sufficient protection. It is possible, however, that the smaller forms at least produce repulsive odors. At any rate, in aquaria I have noted larger waterstriders seize *Microveliae* and promptly release them uninjured. *Hydrometra,* owing to its inconspicuous form and to its habit of standing on stems rising out of the water, seems also to be safe from enemies.

It is in the Cryptocerata, mainly deep water dwellers, except Ochteridae and Gelastocoridae, that we find the few real protective adaptations.

Takahashi has pointed out, what I also have repeatedly observed in nature in *Ochterus banksi,* that the nymph of *O. formosanus* carries on its back little grains of sand. *O. banksi* seems to acquire more or less of a muddy coat. In consequence, when these nymphs squat in little holes on the muddy or sandy surfaces on which they congregate, they immediately merge into their surroundings. *O. banksi* seems to be a denizen of black marshes where its own black coat makes it invisible on the dull surface of the black mud, where it crouches motionless in some little pit. *Gelastocoris,* on the other hand, seems to be a denizen of sandy or pebbly beaches. All the known species have the same peculiar mottled shagreened effect. On a sandy flat or beach they merge at once into the surrounding soil. They are so still they look like an inconspicuous lump of sand. Hungerford gives an excellent illustration of a concealed Gelastocoris in his Biology of Aquatic Hemiptera. The other members of the family Gelastocoridae—*Mononyx, Matinus, Nerthra, Peltopterus*—are either more or less granulose and variegated, or dull and muddy looking. It has been reported that some have been taken concealed in mud, which they quite resemble in color and with which at times we find specimens covered.

The Belostomatidae and Naucoridae in general are of sober dull brown-greens which must harmonize with the underwater aspect of the vegetation, dead leaves, trash and mud among which they hide. *Belostoma flumineum* has been studied by Dr. H. H. Severin who found it exhibited marked death-feigning or cataleptic ability. I have never been able to quite convince myself that this is a protective tropism, since the insect is small, an active swimmer, very ferocious and given to concealment; so outside of its own kind it would seem to have nothing to fear. But its own would take little account of trance, catalepsy or death-feigning, but would indeed profit by it to at least start their meal without a struggle. The larger ones are fierce, strong and active, and endeavor to escape by main force or by attack or threat of attack. In fact, so far as one may judge by aquarium observations, if in danger, Belostomatids seem to place reliance on speed as a means of escape.

Corixidae are generally protectively colored or patterned, so as to be inconspicuous on the bottoms to which they cling by preference. As to Notonectidae, the majority of the species are sufficiently large and brightly colored to be quite conspicuous. The sole exceptions are in the subfamily Pleinae in which the average run of species does not quite equal 3 mm. in length, one *Helotrephes* being barely over 1 mm. These little species crawl about aquatic vegetation, hiding among the leafage or in the crotches of shoots from the main stem, or elsewhere on the plant. In such situations they are quite inconspicuous.

Finally, we come to the only truly mimetic group in the aquatic Hemiptera, the Nepidae. Nepa and its allies conceal themselves in mud or under water. Ranatra, on the other hand, has certain protective resemblances to little twigs. Its color is generally an inconspicuous brown or grey (which looks dark when wet), its form is narrow and twiglike in effect. Its motions under water are slow and deliberate to a degree. When stalking prey it seems scarcely to move. But it is as quick as light when it strikes. It generally lies concealed among grasses rising out of the water, in places in which there are twigs. When seized, or taken out of its element, it goes into a death-feint, its stiff, ungainly long legs crooked and pointing every which way. It is hard to detect among the rubbish with which it comes into the net.

But always I ask myself the question—What do these subaquatic dwellers look like to each other, and to the great fishes, their gigantic enemies? Though, be it said, none except Corixidae become fish food to anything more than a most limited degree.

THE HONEY ANT MYRMECOCYSTUS MELLIGER AT SAN ANTONIO, TEXAS.

By H. B. Parks, State Apicultural Research Laboratory, San Antonio, Texas.

As the majority of papers relative to the honey ant (*Myrmecocystus horti-deorum*) describe a species which is common to the Mountainous Regions of the Southern Rockies it was rather interesting to find honey ants very common all over the Rio Grande Plain of Southwest Texas. Neither Wheeler or McCook mention *M. horti-deorum* as being found in Texas and Wheeler in speaking of eight sub-species of *M. melliger* does not mention the finding of repletes in their nests. Some five years ago a nest was discovered in a gravel-pit near this Laboratory. A cave-in exposed a section of wall some twelve feet in height. The split revealed a longitudinal section of a large nest of honey ants. The ants entered a hole in the loose gravel near the tap-root of a Brazil bush (*Condalia obovata* Hook) and their tunnel followed the tap root downward for about four feet. At this point they had a number of galleries containing ants in all stages of development. There were no indications of stores in this part of the nest. From the lower part of this system of galleries a tunnel continued downward in as nearly a straight line as the large gravels would permit. At ten feet there were a few galleries and at twelve feet the tunnel entered a layer of soft yellow sand. Here was a space of about four or five cubic feet which was filled with galleries containing repletes in all stages of fullness. These galleries were hemispherical in form both of ceiling and floor. The diameter of the hemisphere was about four inches, the distance between the ceiling and floor being about three-eighths of an inch. This enabled the worker ants standing on the floor to care for the repletes which hung from the ceiling. Each gallery contained about fifty repletes. No sooner had the discovery been made than the Mexicans who were loading sand and gravel took charge of things and it was with difficulty that I obtained a sufficient number of repletes to prove the discovery of honey ants at San Antonio. It was rather comical to see the Mexican laborers standing around, each one with a handful of repletes and eating them very much as one would eat strawberries. They would place the abdomen of the honey ant in their mouths, bite off the head and thorax which was then discarded. I believe the total number of repletes taken from this nest would have been close to a gallon. The repletes were filled with a thick dark amber honey which very much resembled the Brazil honey stored by honey bees. Having become familiar with this ant a close lookout was made for the nests and they were found in abundance. In fact, this ant is one of the common species from the Edwards Escarpment to the Rio Grande River. It is found wherever Brazil (*Condalia obovata* Hook), Lote (*Zizyphus obtusifolia* Gray) and Colubrina (*Colubrina texensis* Gray) are found. The nests are located in almost any kind of a place. Near San Antonio they are found in the chalk hills among the rocks, on the flat land in soft dirt, and in the timber under the roots of trees. A very close watch has been made of this ant during the past five years and we have found that it obtains its honey almost altogether from the shrubs mentioned above. It could not obtain the honey from the galls of oak as in many places the nests are miles from the nearest oak trees. The insects work on the cloudy days so one has an ample opportunity of studying their honey gathering ability. When the shrubs mentioned are in bloom the plants will be very heavily infested with these ants, each one at work on the exposed nectaries. It is to be said that in digging out nests of this species that very often cavities are found which are completely filled with grass seeds and quite often the ants are seen carrying the seed of Colorado grass into their nests.

Mr. A. K. Boyles, taxidermist of the Witte Memorial Museum of San Antonio has succeeded in transferring the honey ants to formicaries with glass fronts. These were placed on exhibit in the Museum. As the ants placed in the boxes contained no repletes he placed a dish containing a mixture of sugar and water in the box. In three days he had a number of completely filled repletes. The replete filled with the clear liquid made a very curious appearance as the abdomen walls were so thin that one could not see them and it appared as though the head and thorax of the replete was standing out by itself. The sugar and water solution evidently did not agree with the honey ants as three of them burst without any apparent reason. Honey in its natural condition was substituted for the sugar syrup. The ants continued to make repletes and have done so until the number of repletes outnumber the workers. Any form of the worker will become a replete. In this cage there are numbers of various sizes of repletes, all of them full fed. As nearly as can be determined without material for comparison this species is *Myrmecocystus melliger.*[1]

There is a relationship between the honey ant and the coyote (*Canis nebrascensis texensis* Bailey) which appears to be constant and to be well known throughout Southwest Texas. This relationship may be stated as follows: The coyote either digs out the nest of the honey ant for the repletes and afterwards uses the hole as a den or the honey ants find the abundant dens of coyotes and occupy them during the summer period because of the softness of the dirt which has been washed in and fills the cavity in the hard soil made by a former occupant of the den. The actually observed facts are as follows: Any new excavation made by coyotes will be found to follow the excavation made by honey ants. Honey ants' nests are frequently found in deserted coyote dens. As it seemed improbable that an animal of the wolf tribe would be attracted by the sugar syrup of the repletes, the work of digging out the honey ant nests was first attributed to armadillos. A very careful watch has proven that the work was done by the coyotes.

Uncommon Coleoptera.—On October 12, 1928, while shaking out piles of partly dried grass and weeds over the sifting cloth in Framingham, Mass., I took three specimens of *Xestipyge geminatum* Lec. I had never seen but one specimen of this before; it was taken by Mr. S. A. Shaw at Hampton, N. H., on April 13, 1924.

Under these same piles of grass I took three specimens of *Corticaria varicolor* Fall. The identity was established through the kindness of the describer, Mr. H. C. Fall, who stated that he had taken the species on Nantucket Island, and had not previously seen the species from Massachusetts. A single specimen was recently found in material taken by sifting at Nantucket by Mr. J. H. Emerton in May, 1928.—C. A. Frost, Framingham, Mass.

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[1] Determined by Dr. W. M. Wheeler as *Myrmecocystus melliger* subsp. *orbiceps* Wheeler.

SOME TINGITOIDEA FROM CENTRAL AND SOUTH AMERICA.

By Carl J. Drake, Ames, Iowa

In the course of the study of the lace-bugs of Central and South America, two new species and several interesting records were found in a small collection kindly sent to the writer by Dr. Edward Wagner, of the Zoologische Staatsinstitut and Zoologische Museum, Hamburg, Germany. The new species and the distributional records are given below.

Piesma cinerea Say, var. *inornata* McAtee.

Male, San José, Costa Rica, 1911–1912.

Monanthia monotropidia Stål.

Male, San José, Costa Rica, H. Schmidt.

Monanthia C-nigrum Champion.

Female, San José, Costa Rica, H. Schmidt.

Teleonemia prolixa Stål.

Several examples of var. *a* Champion; Santos and Pernambuco, Brazil; Paramaribo, Dutch Guiana; Ecuador.

Teleonemia lantana Distant.

Male, San José, Costa Rica, H. Schmidt.

Teleonemia validicornis Stål.

Male, Paramaribo, Dutch Guiana.

Teleonemia brevipennis Champion.

Male, Marcapata, Perú.

Teleonemia albomarginata Champion.

Male, Paramaribo, Dutch Guiana, C. Heller.

Sphaerocysta globifera Stål.

Male, Santos, Brazil, Jan. 1, 1904, Dr. H. Brauns.

Tingis colombiana n. sp. (Fig. 1.)

Broadly ovate, clothed with very fine, decumbent, inconspicuous pile; brownish testaceous, the head and calli brownish black. Antennae moderately stout, rather short, beset with bristly hairs, brownish; segment I short, stout, a little stouter and longer than two; III slenderest, less than twice as long as four; IV strongly enlarged towards tip, blackish.

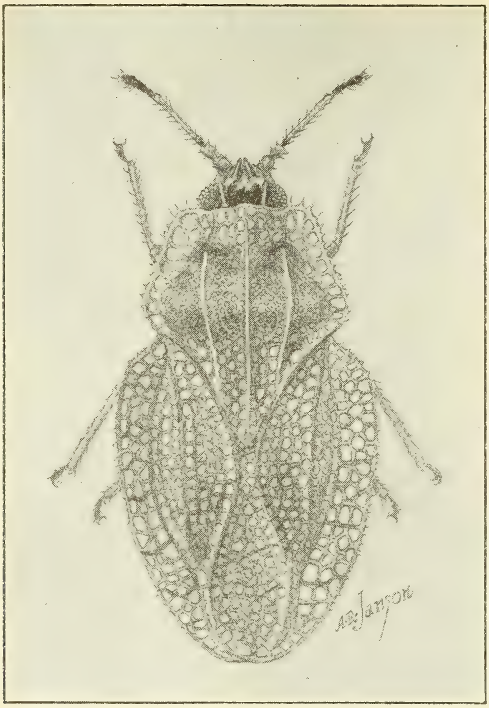

Fig. 1, *Tingis colombiana* n. sp. (type).

Head very broad, short, with five moderately long, somewhat decumbent, testaceous spines. Rostral channel widening posteriorly, open behind, the rostrum extending to the posterior margin of anterior coxae. Bucculae brown, contiguous in front. Legs rather short, brown, the tarsi black.

Pronotum broad, strongly swollen through disc, coarsely pitted, tricarinate; lateral carinae diverging anteriorly and extending to the calli, indistinctly reticulate, the median slightly more elevated; collum very distinct, reticulate, somewhat raised in the middle, there faintly projecting anteriorly. Paranota narrow, faintly reflexed, biseriate in front, uniseriate along humeri. Elytra broad, considerably longer than abdomen, rounded behind (both taken together); costal area broad, irregularly bi- to triseriate; subcostal area triseriate; discoidal area long, broad, extending to the apical fourth of elytra, the outer margin arcuate, composed of five rows of areolae at its widest part, narrowest at both base and apex.

Length, 2.02 mm.; width, 1.21 mm.

Holotype, male, Sabanilla, Colombia, S. A., in Zoologische Staatsinstitut and Zoologische Museum, Hamburg, Germany.

General appearance similar to *T. americana* Drake, but differing in having a shorter antennae and much smaller areolae of elytra and paranota. *T. corubiana* Drake is more elongate—ovate and very closely reticulated; the antennae are also much longer and thicker and rather indistinctly pilose.

Corythucha fuscomaculata Stål.

6 specimens, Rio de Janeiro and Sao Paulo, Brazil.

Corythucha palmatis n. sp.

Brownish testaceous, a few of the nervelets of paranota, median carina and sutural area, and a narrow transverse band near the base and a more or less indistinct oblique band (nervelets only) near the apex of elytra brownish. Areolae hyaline. Hood moderately large, strongly inflated behind, its length twice its height, with a few short, black-tipped spines on the side. Antennae moderately long, clothed with numerous long bristly hairs, pale brown, segments III and IV testaceous. Rostral laminae widely separated on meso- and metathorax, contiguous behind; rostrum brownish testaceous, the apical segment fuscous, reaching between intermediate coxae.

Pronotum considerably swollen, smooth, polished, finely punctured, indistinctly reticulated behind; lateral carinae short, strongly curved, rounded above, widely separated from hood, each composed of three areolae; median carina not strongly raised, uniseriate, at its highest place about one-fourth as high as hood, distinctly shorter than hood. Paranota long, broad, the outer margins beset with numerous, moderately long spines. Elytra with large prominent tumid elevation; costal area wide, mostly triseriate, with short spines along the basal two-thirds of outer margin, the areolae smaller and irregularly quadriseriate at base. Body black; legs testaceous. Wings a little longer than abdomen. Male clasper brownish, strongly curved. Length, 3.24 mm.; width, 1.76 mm.

Holotype (male) and *allotype* (female) San José, Costa Rica, Central America, H. Schmidt, in Zoologische Staatsinstitut and Zoologische Museum, Hamburg. Paratypes, 2 specimens, taken with types, in writer's collection. This species resembles to some extent *C. mcelfreshi* Drake, *C. decens* Stål, *C. baccharidis* Drake, but may be distinguished from them by the much smaller and less inflated hood.

THE NORTH AMERICAN SPECIES OF PARANDRA (COL. CERAMBYCIDAE).

By Chas. Schaeffer, Brooklyn Museum, Brooklyn, N. Y.

The two species, *ampliceps* and *gravidula,* described by the late Colonel Casey are omitted from the following table as I was unable to identify with certainty either one in my material, and remarks on them will be found below.

Key to Parandra.

1. Onychium distinct, with two setae (paronychia), one on each side of apex; anterior intercoxal process straight between the coxae, feebly arcuate and distinctly prolonged behind; eyes not emarginate internally; anterior margin of prothorax strongly oblique on each side near anterior angles; form relatively narrow and depressed; prothorax and elytra rather sparsely and finely punctate ....*polita*

Onychium absent; intercoxal process distinctly arcuate and not prolonged behind the coxae; eyes emarginate internally; anterior margin of prothorax almost straight to the angles. Form broader and more convex; punctuation of prothorax and elytra variable 2

2. Punctuation of elytra exceedingly fine and sparse, almost invisible, punctures on prothorax distinct, moderately large, sparse on the disk but more numerous at sides 4

Punctuation of elytra distinct, equal or subequal to that on the prothorax 3

3. Subapical transverse impression of prothorax absent in the male, but very distinct and not interrupted at middle in female .... *brunnea*

Subapical impression of prothorax distinct but interrupted at middle in the male; larger with relatively finer punctuation of prothorax and elytra but mandibles more coarsely and closely punctate than in *brunnea;* female unknown. **marginicollis**

4. Subapical impression of prothorax in the male distinct but narrowly interrupted at middle; mandibles of male rather sparsely punctate with moderate punctures. Subapical impression of prothorax in the female absent at middle but distinct and generally deeply impressed on each side for about one-third the width of the margin ...... **punctillata**

Parandra polita Say.

This species, which is more elongate and less convex than *brunnea,* will be readily known by the characters given in the table.

It was described by Say from Indiana and is recorded in the Leng catalogue from the Southern States, Texas and Arizona. It occurs also in different localities in Mexico and Central America.

Parandra brunnea Fab.

Our well-known and common species is a variable insect, especially in regard to the form of prothorax and head, and it also varies greatly in size. Thomson in Physics, 1867, pp. 114–116, described five species based mainly on the form of prothorax and two of these from single females. They are nothing else than individual variation and are properly placed as synonyms of *brunnea* in our lists. The mandibles of the males generally have three more or less distinct teeth on the inner edge, one near apex, one near middle and one a little below base, the last two are occasionally more or less confluent. Two large males, however, one from Wisconsin and the other from Ithaca, N. Y., have the mandibles more slender and relatively longer, bidentate only, the upper tooth entirely wanting but as they do not possess any other distinctive character, I consider them at present as aberrations of *brunnea.*

It is apparently a widely distributed species if all the localities given in the Leng catalogue are correct, though I have before me two specimens from the Nat. Museum collection, kindly loaned by Mr. Fisher, which are labelled "Ariz."

Parandra ampliceps Casey.

The main characters separating this species from *brunnea,* as given by its describer, are the larger eyes and the carina along the anterior face of the hind tibiae much nearer the inner than the outer edge. This latter character is apparently not only variable but also varies in the same specimen if viewed from different angles. The subapical transverse impression of prothorax is absent in the male and distinct but interrupted at middle in the females in the types, also in *gravidula* as Mr. Fisher kindly informed me, and therefore both would go with *brunnea* in my table.

I have two males, one from North Carolina and one from Long Island, N. Y., and also several females, which I place here with a little doubt. It seems to me that *ampliceps* is a more strongly developed form of *brunnea* and would perhaps be better placed as a variety of the latter than as a distinct species.

Parandra gravidula Casey.

This species is differentiated by its describer from *brunnea* by the stouter form, the antennae not quite so long as the width of the head—much longer than the width of the head in *brunnea*—margin of epistoma abruptly dentiform at the middle—gradually and feebly anteriorly prominent medially in *brunnea.*

Casey's specimens were from Pennsylvania and westward and he says that it is abundant, while he apparently had only one male from New York of what he determined as Fabricius' *brunnea.* In my material I could not find a single specimen in which the antennae are shorter than the width of the head. The prominent or dentiform process at middle of anterior margin of epistoma, however, is variable and if Casey was correct in the measurement of the antennae, *gravidula* should be considered a variety of *brunnea,* otherwise as a synonym.

Parandra marginicollis n. sp.

> Form and color as in *brunnea* but generally larger than that species, prothorax at anterior margin with a more or less distinct transverse impression, deeply impressed laterally but gradually becoming shallower toward middle, where it is obsolete; punctuation of head, prothorax and elytra much finer than in *brunnea.* Length, mandibles excluded, 14–22 mm.

Two specimens from Los Angeles Co., Calif., in the Dietz collection of which the largest one (22 mm.) is considered the type and two specimens in the National Museum collection, one from Los Angeles Co., Calif. (Coquilett), the other from S. Bernadino Mts., Calif. (C. C. Zeus), paratypes.

Only males have been seen.

Parandra punctillata n. sp.

> Form and color of *brunnea,* but with very fine sparse, nearly invisible, small punctuation of elytra which is more evident at sides; prothorax more distinctly punctate with larger punctures.
>
> *Male:* Prothorax near anterior margin with a shallow transverse impression, which is more or less interrupted at middle.
>
> *Female:* The transverse anterior impression of prothorax distinct at sides but broadly interrupted at middle. Length, mandibles excluded, 15–20 mm.

Male type and female allotype from Sta, Catalina Mts., Arizona (Christman coll.), in the National Museum; paratypes from Prescott, Arizona, in the Brooklyn Museum.

Described from three males and three females, two of the latter have the interrupted transverse impression of prothorax very deep at sides, in the other specimen the impression is more faint.

EDITORIALS.

ON ENTOMOLOGISTS AND ENTOMOLOGY.

One eminent human trait seems to be to consider one's self a second (and better) Michael Angelo or Homer or Alexander; and so, able to essay *anything* and get away with it. Another trait, no less eminent, is contrariwise. Knowing one's self to be no M.A., H. or A., one therefore is capable of *nothing.*

There is always a middle way. Without nursing any preconceived (and probably grandiose) idea about one's capability—try anything once. The heroes of old simply did things—and lo! they became epic figures!

We have put our exemplars back into the dim and legendary ages; and selected them with careful purpose far from the lines of modern endeavor to make it impossible for any of our readers to imagine he recognizes himself to be singled out for dissection.

And these minor premises being established, let us now consider the writing of entomological articles.

A great and noticeable lack in our entomological journals is short notes on flying observations. These notes are frequently of great value; and always of general interest. But the hopeful Homers cannot spare the time from the magnum opus to pen them; and the abased Alexanders feel themselves unworthy to burst into authorship.

Now, entomologists are human beings; and each in his way can bring his mite to the collection of data which goes to make up the fulness of the science. Almost any random minor note may be the starting-point for a valuable piece of research. And any entomologist who goes into the field has seen many things of great interest; or at least novel to him. Consider, for interest, the historical value of the first note on the Japanese beetle in the United States; or on the spread of the cotton-boll weevil; or on the extinction of chinch bugs by fungi. And yet similar things come under our observation; and the mighty minded consider them useless to note and unworthy of their powers; and the humble minded hesitate to burst into print in the presence of the great, with what is nothing but an irrelevant trifle—or so they think.

Imagine, if you can, a great artist painting a pastoral scene of sheep and shepherd without a background! And that is precisely the effect of minor observations—the background which harmonizes the great facts.

So we ask our friends entomological to send us many minor notes. We can use them. And if they should not be usable or the facts already known; we can return them with *polite* regrets.—J. R. T. B.

"FIT TO PRINT."

Of course, all matter in entomological journals is fit to print—not the bitterest moralist could object to their content. But while fit to print, should some things be printed? (This query is in the universal interest.) Now, we have with us at all times those good men who go into perfect orgies of describing varieties, forms, aberrations and even minuter subdivisions of species, isolated and alone. While the argument that such descriptions are needed, for they may reveal the course of the evolutionary flow of a species, is perfectly valid, it nevertheless may be pointed out that such descriptions when alone have no striking taxonomic value.

While we have on occasion published such descriptions of minor divisions of species, we have decided to publish in the future only such as occur in general work, monographic work or discussions of interrelationships of species and forms.—J. R. T. B.

BOOK NOTES.

Pond Problems, by Ernest E. Unwin. Pp. i–xvi + 1–117, figs. 1–47. (The Cambridge Nature Study Series, The Macmillan Co., New York. $1.20.)

Any of our readers who feel that way inclined may believe me pro-British, for certainly, I shall always maintain that in the popular, non-technical presentation of science to amateurs, the English far outdistance us. They never sacrifice scientific accuracy to imagination; nor, on the other hand, do they set forth dry fact in an unembellished and Gradgrind fashion. Perhaps this is a matter of tradition and taste with them; or perhaps it is a cultural background of the classics and all that goes to constitute a liberal education. Even those who from social limitations have not been able to afford a university training, appear to absorb and make their own the general atmosphere of taste and the art of expression in facile English. This felicity in phrasing popular works, of course, also holds for the French and other Continental nations, within their own ways. But I lay stress on the English, for they are at least our cultural forebears, however much we as Americans may be racially mixed or hybridized. What the English can do, we also can, but seemingly do not essay, with a few shining exceptions. It is true we have produced some popular science, a little of it good. But the rest is either so obviously written down; or else, while compressed, it continues to be abstruse and couched in the esoteric language of the professors; or perhaps it is written by some one with a flow of words in inverse ratio to sufficient knowledge, an unrestrained and anthropomorphic imagination, and a sweet independence from the few facts he (more generally, she) may have culled from some outdated presentation of the subject under treatment. On this subject Professor East has said: " Of some fifty books for the general public purporting to be psychology that I have recently examined, two-thirds appear to have been written by voodoo worshippers. From a still larger number of volumes on biology, chemistry, physics, and their applications, I find less than half a dozen which give the impression that the authors are acquainted with their subjects. Yet if one were to believe the high voltage " blurbs " written by the publishers, this scrivening is serious stuff, indited by the world's most celebrated thinkers."

All entomologists are familiar with the remark " Of course you have read ———'s ' Beetles of the Timbercoast? ' Isn't she just wonderful! And aren't the bugs just too funny for anything!" If you confess you haven't, you at once reveal your crass unfamiliarity with your subject. If you deprecatingly admit knowing something about the opus, but aver it is scarcely to be taken as scientific, you at once get the utmost credit for scientific jealousy. And if you mildly say that it is full of commonplaces and very wordy, you at once are set down (invidiously) as a second Darwin in respect to a complete loss of appreciation of the finer things of art and literature, of which this book is a splendid example, destined to live long in the annals of American literature. This pap is what is believed to be a proper popularization of science, to bring it down to the level of the educable masses, as it were.

" *Pond Problems,*" the little book that is the motive of the commentary just ended, is such a work as we should have in this vast and great country of ours, a land avid for knowledge of the truths of nature. Rife about us are false values and false views of living, its art, purpose and joy. In the study of nature—nay, in the intimacy with nature in its day by day life—we have the corrective to these, the truth that shall make us free; that shall give us a perspective and a course to follow in the stress and turmoil of the modern world.

"*Pond Problems*" was originally printed in England in 1914; before me is the 1928 reprinting. It is to-day as informing and useful as it was fourteen years ago.

Professor Unwin, the author, is now headmaster of the Friend's School, at Hobart, Tasmania. Before this, he had been demonstrator in zoology at Leeds University, under the noted Professor Miall; and later science master at three English schools. His experience in shaping young minds is shown by the illustrations of healthy English lads he has photographed at their collecting; and particularly by the arrangement and presentation of the matter of this book.

Obviously, this work is designed for the upper school grades, even into high school—that is, for young people from about 10 years of age to 16 or over. Equally obviously, it aims to get at exact (and known) facts through the efforts of the students themselves, under the guidance of more competent heads—in other words, to *educate* them in a given section of biology, in the primitive meaning of that much misused word. Equally, though less avowedly, this little book is a text on the scientific method of arriving at facts by rigorous experimentation. For those that have the taste, of any age, this is an excellent guide to the study of the insect life of ponds; the many suggestions, questions, experiments, and problems set forth guide the student to the known facts, from which, by careful observation, it is possible to proceed to others still undiscovered.

Hence, as it stands, it is one of those books which ought to be in every summer camp for boys and girls; and it should be used by both Girl and Boy Scouts as a part of the nature requirements. For through the use of this small book it is possible to study many of the universal problems of biology—development, physiology, adaptations—in a relatively brief time and with living beings that flourish in captivity and are simple to confine and control under natural conditions.

Professor Unwin's opening sentence, "The study of environment and its effect upon living things is one of the most interesting branches of the science of life," is the key to the purpose of the book. Not all the study of all the dry and pickled specimens in the world is going to show *how* living things *live*. Nor can we study life at a laboratory table from the dissection of a pickled grasshopper or of an embalmed cat. We must go to life to question life!

"How to obtain Specimens" is the first chapter, which ranges from the ponds, their inhabitants and how to catch them, to the instruments and apparatus needed and the proper preparation of aquaria. The next chapter studies the reply to the question "What Is an Insect?" and gives eighteen numbered suggestions for experiments and studies. In chapter III is a statement of the problems presented to insects (and solved by them) incident to life in the water, an alien and hostile element to air breathers, as insects are. The chapter following takes up breathing and gives thirty-six suggestions for study. The surface film of water is the subject of chapter V, with twenty-nine problems and queries; and in the next chapter the diving-tubes and diving-bells of insects are considered and thirty-eight problems are set. Gill breathing is studied in the following chapter, where sixty-one problems are set forth. Chapter VIII presents 105 subjects on methods of locomotion; and chapter IX tells of the ways in which mature insects whose young live in the water escape that deadly element when they come to maturity, to soar freely in the air as adults, with sixty-four suggestions for study. The " Life Stories. From Egg to Imago " form chapter X, where they are elucidated by means of fifty-five experiments. The Appendices give the methods of securing material, names of dealers, apparatus, the use of the microscope, and the names of books on the subject of aquatic and insect life, all, of course, from the English standpoint; and equally, of course, as relates to books and dealers, not of great use to us in this country.

The insects treated of in this little work are naturally of the same orders and families as with us—Odonata, Ephemerida, Perlidae, Dytiscidae, Gerridae, Culicidae, and others. With some few exceptions, the genera are the same as ours. Naturally, the species are different. The general problems, however, are the same, even though in some details ours may differ.

This is easily a book which can be recommended to any one interested in insects and their ways of living. In a way, it complements Needham's just published " Elementary Lessons on Insects." But few changes in this little work would adapt it exactly to American conditions. Even as it is, it is very helpful. And its low price makes it more widely available than the usual run of books for amateurs that make the least pretense to scientific accuracy.—J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

Meeting of May 10, 1928.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday evening, May 10, 1928, at 8.21 p. m.

President Davis in the Chair and 12 members present, viz.: Messrs. Bell, Bromley, Chapin, Engelhardt, Rau, Schaeffer, Schiffer, Sever, Shoemaker, Siepmann, Torre-Bueno and Willis, and two visitors, Mr. Pollard and Mr. Abbot.

Minutes of the previous meeting read and approved.

Mr. Engelhardt presented the report of the Treasurer, and remarked that though the cash balance on hand seemed to be very large, there were many bills to be paid before the first meeting in the fall, when his report will probably show some reduction in the cash balance. Mr. Engelhardt's report was received with thanks.

Mr. Torre-Bueno reported for the Publication Committee, the April number of the Bulletin was delayed because the galley-proof had been lost in the mail, but that the issue would appear shortly.

Mr. Engelhardt read a circular letter from Dr. A. F. Satterthwait, Associate Entomologist, in Charge, U. S. Entomological Laboratory, Webster Groves, Mo., offering to pay ten cents apiece for adult specimens of Calendra (bill-bugs) if delivered at his station by May 10, which date may be extended, the eggs of which are to be used to propagate *Anaphoidea calendrae* Gahan, a Mymarid infesting the eggs of *Calendra* species; these parasites are to be used by the Hawaiian Sugar Experiment Station to aid in the control of the Hawaiian sugar-cane borer, *Rhabdocnemis obscurus*. Mr. Engelhardt exhibited a box containing four species of bill-bugs.

Mr. Pollard announced the receipt by the Museum of the collection of insects of the late A. C. Weeks and said that most of them were in good condition but that Dermestes had attacked some boxes; he exhibited a box of specimens of *Hamadryas antiopa* Linne which were beautifully spread.

Mr. Davis exhibited a copy of " Biological and Taxonomic Investigations in the Mutillid Wasps," by Dr. Clarence E. Mickel, a book of 351 pages and 5 plates. This useful publication, known as " Bulletin 143, U. S. National Museum," contains numerous records of specimens from Long Island. Mr. Davis also exhibited, as an addition to the New York State List of Insects, the butterfly *Thecla cecrops* Fabricius collected by Mr. Roy Latham, August 14, 1912, at East Marion, Long Island. Mr. Latham also collected a second example of this species on the same date. This southern butterfly has been recorded in the List of New Jersey Insects from " Manasquan, June 29 (Brehme); one male only." Mr. Davis also exhibited some pupae of the Seventeen-year Cicada which had been dug up on Staten Island; he also commented on the fine plates in Johnson's paper on the " Cicadas of New England " and showed circular no. 97 issued by the State of New Jersey on the " Cicadas of New Jersey," by W. T. Davis.

Mr. Engelhardt reported that the check of the Society for $100 had been sent to Dr. Crosby, representing the donation of the Society to the fund to help defray the expenses of the foreign visitors to the International Congress; he said that the visitors would arrive in New York, from August 8 to 11, and that a reception was to be tendered to them, probably at the Pennsylvania Hotel, and that he thought that the Society should be represented on the Committee designated to welcome them, and moved:

" That a committee of three (3) be appointed by the Chair, to be among those to receive the foreign entomologists to arrive in August to attend the Entomological Congress to be held at Ithaca, N. Y." This motion was duly seconded and approved, whereupon Pres. Davis appointed the following to serve on that committee: Messrs. G. P. Engelhardt, J. R. de la Torre-Bueno and Charles Schaeffer.

Mr. C. L. Pollard presented his paper on " Mimicry and Tautopsis," saying that the word " mimicry " was too indefinite and proposed the new term " tautopsis " to take its place when referring to insects which resemble each other in superficial appearance, tautopsis being derived from two Greek words meaning " the same appearance "; he also proposed the word "cryptopsis," meaning "concealed appearance," for insects which resembled their surroundings; the division tautopsis he further separated into three divisions: Protective tautopsis, including the clear-wing moths, certain larvae which try to frighten their enemies by a terrifying appearance and other instances where the similarity of appearance is for protection; aggressive tautopsis, as in the case of asilid flies, spiders that look like ants, etc.; and Sematic tautopsis, in the case of unprotected butterflies which resemble other distasteful species; cryptopsis he divided into two divisions: anticryptic or aggressive cryptopsis, as in the case of spiders resembling part of the flowers upon which they await their prey, and procryptic or protective cryptopsis, as in the case of *Catocalae, Geometridae* and certain larvae which simulate their surroundings; he said that tautoptic species occur in the same area and occupy the same station as the models, are always more defenseless, are always less numerous as individuals and differ from the bulk of their allies, and that tautopsis is external and visible only; he mentioned the case of an African butterfly which has a wide distribution, which has several forms of the female occurring in various parts of its range, and which resemble others of distasteful species occurring in the regions where found. Mr. Pollard expects to publish his paper in full. Mr. Pollard exhibited a box of butterflies and a chart to illustrate his remarks.

Mr. Pollard's paper was discussed at length by the members.

Mr. Shoemaker exhibited five boxes of specimens and related his early experiences collecting around Brooklyn with the late Mr. A. C. Weeks from 1898 to 1904.

Mr. Engelhardt briefly related his experience on a five weeks' trip, just completed, on which he visited experiment stations and colleges at Tallulah, La.; College Station, Austin, Texas; San Antonio, Brownsville, Dallas, Iowa Park, Texas; Norman and Stillwater, Oklahoma; Manhattan and Lawrence, Kansas, and Columbia, Missouri.

A more detailed report on his investigations and collections will be made at a fall meeting.

It was decided to omit the June meeting.

Adjourned at 11.00 p. m.

E. L. Bell,
Secretary.

Meeting of October 11, 1928.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday evening, October 11, 1928, at 8.15 p. m.

President Davis in the Chair and the following members present: Messrs. Bromley, Chapin, Engelhardt, Nelson, Rau, Schaeffer and Siepmann, also three visitors, Messrs. C. L. Pollard, Hans L. Stetcher and C. F. Burke.

In the absence of the Secretary, Mr. Pollard acted as Secretary *pro tem.*

Minutes of the previous meeting read and approved. Mr. Engelhardt presented the report of the Treasurer showing a cash balance of $1,679.53. The report was received with thanks and ordered placed on file.

Mr. Engelhardt also reported for the Publication Committee that the current issues of the publications had been delayed, but would be brought up to date.

The Secretary *pro tem* read a letter addressed to the Society from J. J. White, Bananera, Guatemala, offering to collect specimens for sale; also one from O. M. Butler, Executive Secretary of the American Forestry Association, asking for the membership list of the Society in order that informative literature might be sent. The Secretary *pro tem* was directed to suggest that application be made to the New York Academy of Sciences for its directory.

The following were proposed for membership by Mr. Engelhardt:

Herbert Ruckes, 167–11 33d Street, Flushing, New York.

Dr. W. J. Holland, Carnegie Museum, Pittsburgh, Pa.

These names were laid over until the next meeting, under the rules.

Mr. Engelhardt exhibited a specimen of the introduced Mantid *Paratenodera sinensis,* taken on the 49th story of the Woolworth Building and commented on the abundance of this insect throughout the city. (See December BULLETIN.)

Mr. Engelhardt then spoke of a recent visit with his friends, H. P. Loding and Thomas Van Aller, at Mobile, Ala., from which he returned only on October 6. As usual his special desiderata were the Aegeriidae, or clear-winged moths, of which fine series of a number of species were obtained. But insect life in other families and orders proved so abundant that the temptation to collect at least a small representation of the commoner things to show at the entomological meeting could not be resisted. Showy butterflies such as *Dione vanillae, Catopsilia eubule, Papilio palamedes, philenor, cresphontes, glaucus* and *turnus, Junonia coenia, Anosia berenice, Meganostorma caesonia, Terias nicippe* and *lisa* were so numerous as to actually add color to the landscape. The fall season along the Gulf Coast apparently fully repeats the abundance of insects to be found there in May and early June. The city square in Mobile, which is shaded by fine old live oak trees, resounded with the chorus of a large colony of giant Cicadas (*Tibicen auletes*). The park loungers were not at all disturbed thereby, but a newcomer could not escape feeling restless. The chorus begins at eight in the morning and continues uninterruptedly until shortly before sunset. Sufficient specimens, dead or dying, could be picked up under the trees. Several examples of *Catocala viduata* were observed resting on the trunks in the park on October 1, which seems rather late in the season as the same species has been collected at Mobile during May. Possibly it is two brooded in the South.

The return journey was made by auto buses over mostly excellent roads as far as Savannah, Ga., with stop-overs at Pensacola, Tallahassee, Lake City and Jacksonville, Fla. This gave opportunity to get acquainted with the towns and the topography of the country, but not much time for collecting, although everywhere insect life was abundant. From Savannah a brief visit was made to Tybee Island with good collecting back of the beach among sand dunes and marsh meadows. The most interesting capture here proved a species of mantis, *Brunneria borealis* Scudder, so much resembling the common walking stick that its identity would not have been discovered except for the fluttering attempts of a butterfly to escape from the grasping front legs of the mantis, which led to the taking of three specimens.

Mr. Engelhardt also exhibited live pupae of the butterflies *Dione vanillae, Junonia coenia* and *Catopsilia eubule.*

Mr. Chapin reported that he had done some collecting in Oneida County, N. Y., and referred to the abundance of *Donacia* sp. at Echo Lake. Later in the season he visited Litchfield, Conn., where he obtained two specimens of the rare *Cicindela harrisii.* Near Ridgewood, N. J., he found a large brood of the moth *Utetheisa bella,* showing great variation.

Mr. Bromley spent two weeks at Webster Lake, Mass., and observed for the first time a living specimen of the rabbit bot fly, *Cuterebra buccata.* He also collected specimens of one of the robber fly, *Promachus fitchii,* which feeds on the larvae of phytophagous beetles. He observed that this lake was an exceptionally fine locality for dragon flies. At Tuxedo, N. Y., Mr. Bromley found a curious abnormal specimen of *Belvosia bifasciata,* a large tachinid fly.

Mr. Siepmann spent some time at Roanoke, Va., where he collected chiefly Coleoptera.

Mr. Pollard commented on the favorable season for Lepidoptera, especially Noctuidae, at Harrison, Maine, where he spent the summer.

Mr. Wm. T. Davis showed a living male and a female of *Melanoplus differentialis* (Thomas) from the colony on the filled-in land near Lawrence Creek, Arlington, Staten Island, on the Old Place meadows and stated that there were many more grasshoppers there this year than in 1924 and 1925. They were found to have spread over a considerable area and on October 3, when the present specimens were collected, a female was seen to be laying eggs near one of the ties of the railroad. These eggs were dug up and were also shown. It is possible that the species may become of some local economic importance as it is destructive at times in the western states.

References were made to the BULLETIN of this Society for December, 1925, p. 199, and to the Journal, N. Y. Entomological Society for December, 1925, and September, 1927, where additional observations on the Staten Island colony of *differentialis* are recorded.

The Society adjourned at 10 p. m.

CHARLES L. POLLARD,
Secretary pro tem.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of all Technical Terms Used in Entomology. By JOHN B. SMITH, Sc.D. (The Glossary) Cloth	$3.00
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Orders for publications must be sent with remittance to LIBRARIAN, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN

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VOL. XXIV APRIL, 1929 NO. 2

ON THE CLASSIFICATION OF BEETLES ACCORDING TO LARVAL CHARACTERS.*

BY ADAM G. BÖVING, PH.D., Bureau of Entomology,
Washington, D. C.

The study of the immature stages of the beetles is still in a preparatory or pioneer state. Much has been written about the larvae; the older synoptic works by Erickson, Schiødte, Perris, and others are of the greatest value, and so are the papers of many contemporary entomologists from different countries; but no complete classification of the coleopterous larvae has been published. Nevertheless, it is unquestionable that the study of the larval stages has brought to light important facts bearing upon the discussion of the phylogeny of the families and their proper classification. Quoting from the impartial and weighty paper by Dr. C. J. Gahan in "The Entomologist," 1911:

> "Conclusions that may be drawn from a study of the external morphology of the imagines alone are sometimes apt to be upset, or at least not completely borne out by a study of the corresponding larval forms. Certainly it is sometimes very surprising to see what great differences there are between the larvae of certain families which otherwise would be considered to be very nearly related."

This assertion of Dr. Gahan I shall try to exemplify.

According to Leng's Catalogue of North American Coleoptera, 1920, the series Dryopoidea includes five families, namely, (1) the Psephenidae, (2) the Dryopidae with genera like *Lara, Parnus* and *Helichus,* (3) the Helmidae, (4) the Heteroceridae and (5) the Georyssidae; and according to the same catalogue the series Dascilloidea includes three families, namely, (1) the Dascillidae with the subfamilies Dascillinae, Eubriinae and Eucinetinae, (2) the Helodidae with Helodinae and Ptilodactylinae and (3) the Chelonariidae.

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* An address delivered at the Fourth International Congress of Entomology at Ithaca, N. Y.

Commenting on this classification, Dr. Leng writes (on p. 32) in the introduction to the Catalogue: "The series Dryopoidea seems to be naturally defined—its elements are not greatly disputed, but forms, like *Placonycha,* can only be placed with certainty by knowing the larvae," and on the next page: "Some genera now included in Dascillidae may have to be removed therefrom when the larvae are better known." The classification and the comments of this catalogue, certainly America's most valuable contribution of the present epoch to the taxonomy of Coleoptera, I propose to use as a sort of background for a brief review of the bearing that the characters of the larvae may have upon the phylogeny and taxonomy of the two series.

Some of these larvae, which have been little or not known in the past, not only evince as you will see a relationship to exist between the Dryopoidea and Dascilloidea, but they also suggest a systematic rearrangement of the forms in each series, and a potential shifting of genera from the one series to the other, as surmised by Leng. Moreover, we are confronted with the possibility that it is from types belonging to the Dryopoid-Dascilloid series that other series, particularly the Elateroidea and the Scaraboidea, may have departed. Finally the larva of *Eucinetus* indicates that this genus may have to be segregated from the Dryopoid-Dascilloid series and placed near the Derodontidae, or Cryptophagidae, or other Cucujoid families affiliated with these.

Lara (*avara* Le Conte?). (Plate I.)

On the accompanying plate the general appearance and the anatomical details are shown of a larva from Portland, Oregon. By elimination and according to locality it has been determined as *Lara avara* Leconte (?). (The correct determination is for our present purpose really of minor consideration, and for the sake of expediency I will risk the assumption that the determination is correct; the larva will from now on be referred to simply as the "*Lara* larva.")

The general appearance of the *Lara* larva is that of a typical *Parnus* or *Helmis* larva. The form of the legs, the development of the segments, the number and location of the spiracles are similar and the spiracles are bifore. The larvae furthermore concur in lacking a maxillary articulating area between the maxillae and submentum, a characteristic morphological reduction which is of great taxonomic importance. However, unlike the larvae of Parnids and Helmids, the *Lara* larva possesses six distinct ocelli on each side, and the mandible has two distal teeth and a short retinaculum. The flat ventral side of the tenth abdominal segment is continued into a flat, longitudinally bisected component part that carries a pair of long terminal hooks. With the underside of the prolonged tergal region of the ninth abdominal segment, this tenth abdominal segment forms a sort of cloacal chamber, but it has no operculum and there are no gills inside of the chamber.

Limnius troglodytes Gyllenhal and *Helichus* sp. (Plate II.)

In general shape the larva of *Limnius* looks much like *Lara.* The larva of *Helichus* is broader, flatter and shorter, has the head completely hidden below the prothoracic shield, the body segments laterally prolonged, the ninth abdominal segment only slightly longer than wide, and all the spiracles absent except on the eighth abdominal segment where they are located at the ends of the lateral prolongations. However, in all anatomical details of taxonomic importance *Helichus* and *Limnius* agree, and these details can therefore be described collectively.

In accordance with the development of the same anatomical features in the *Lara* larva, the larvae of *Limnius* and *Helichus* have elongate antennae, their mandibles have no molar part, the maxillae project into a distinct lacinia and a distinct free galea, ligula is broad, mentum and submentum broad.

Together they differ from *Lara* in the following cardinal points: there is only a single but large ocellus on each side, the mandible has a simple apex and vestigial or no retinaculum, and the ventral part of the tenth abdominal segment forms a movable lid or " operculum " that acts against and fits into a trough-shaped concavity in the underside of the tergal shield of the preceding segment. On top of the operculum (figs. M and N) is a soft pad with two minute spines which are homologous with the strong hooks of *Lara.* Both the pad and the spines are hidden in the cloacal chamber, and this contains in addition to the spines three well-developed tassel-like projectile or retractile gills.

Amphicyrta chrysomelina Erickson and other Byrrhid larvae. (Plate III.)

To explain the taxonomic position of the *Lara* and the Helmid-Dryopid larvae a brief discussion of some of the Byrrhid larvae is necessary.

Byrrhid larvae differ from the larvae of *Lara* and the Helmid-Dryopid by having a large maxillary articulating area (a figs. K and R) and this is in fact the only essential character by which they can be separated. To be sure, the development of the ninth and tenth abdominal segments in the Byrrhids conforms more with the normal development of these segments in beetle larvae in general than does that of *Lara* and the Dryopids. However, the tenth is unusually large in Byrrhids and the ventral portion below anus somewhat protrudes, and is in *Amphicyrta* divided into a proximal portion and a distal portion which terminates in a spine (fig. L). Thus the actual dissimilarity between these features in *Amphicyrta* and in *Lara* depends solely on a variation in degree and not in substance, the features are homologous. It is also true that no Byrrhid larva possesses a cloacal chamber even of the imperfect type in *Lara,* but neither is a cloacal chamber found in all larvae belonging to the Dryopoidea, as we shall see later on.

The Byrrhid larvae have, just as the *Lara* larva, six ocelli on each side and nine pair of lateral and bifore spiracles. In the larvae of *Amphicyrta* and *Lioon* the mandible (figs. T and Q) is distally multidentate, but in *Cytilus* (fig. A) and *Byrrhus* it is bidentate with a short retinaculum as in *Lara.* However, it should be noted that all Byrrhid larvae have a long series of hairs in the posterior part of the inner mandibular margin.

Taking one thing with another, the logic of the presented facts bears out that the Helmid-Dryopid larvae have developed from Byrrhoid ancestors, probably with *Lara*-like larvae as connecting links.

Byrrhus fasciatus Forster. (Plate IV.)

The setose posterior portion of the mandible (figs. B and E), just said to be characteristic for all true Byrrhid larvae, projects conspicuously in *Byrrhus fasciatus* and is markedly set off from the rest of the mandible. It suggests a rudimental molar part and confronts us with a morphological differentiation of importance for the understanding of the complicated mandibles which are found in the larvae of the genera *Heterocerus, Dascillus, Nosodendron,* and *Cyphon,* together with other Helodinae.

At the same time our attention is given to the changes in the form of the mandible, it is pertinent to mention that a corresponding transformation takes place in the hypopharyngeal region. For, while hypopharyngeal chitinizations are absent (figs. T and K) in all true Byrrhid larvae as well as in the *Lara* larva and the Dryopid-Helmid larvae like *Limnius* and *Helichus,* they are present and as a rule highly specialized in the four above-named larvae with complicated mandibles.

Psephenus lecontei Le Conte and *Eubrianax edwardsi* Le Conte.

(Plate V.)

In the discussion of the value of the cloacal chamber as a potential character to separate the larvae of the Dryopidae from the larvae of the Byrrhidae, I remarked that this organ does not occur in the larvae of all the genera which have been placed in the Dryopoid series and had in mind the larva of *Psephenus* and also the closely related larva of the genus *Eubrianax,* which customarily is placed in the series Dascilloidea.

The differences between the *Psephenus* larva and the *Eubrianax* larva are slight and immaterial from a taxonomic viewpoint; the two larvae can mainly be distinguished by the different form of their second thoracic tergite, by the existence or conversely the repression of the lateral prolongations from the eighth abdominal segment and by a small dissimilarity in the location of their spiracles.

Their coccid-like body is not very different from the body form of *Helichus* and almost identical with that of the larva of *Psephenoides,* another genus of the family Dryopidae.[1] Their antennae, mouthparts, the presence of a single large ocellus on each side, and the reduction of most of the spiracles are also characters which they have in common with the two Dryopid genera. However, by a further comparison of the taxonomic characters the following two fundamental differences are found between the larvae of the Psephenidae and the Dryopidae: In the first place the larvae of the Psephenidae (meaning the genera *Psephenus* and *Eubrianax*) possess below the first to fifth abdominal segments freely exposed gills which are absent in the Dryopidae; in the second place no terminal cloacal chamber with three feather-

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[1] See Adam G. Böving: The Immature Stages of *Psephenoides gahani* Champ. (Trans. Ent. Soc. London, vol. 74, 1926, pp. 381–388, plates 89 and 90.)

or tassel-like gills is found in the Psephenidae, but it always developed in the Dryopidae.

The usual taxonomic arrangement of the family Psephenidae close to the Dryopidae (including the Helmidae) is substantiated by their larvae, but this does not mean that the Psephenidae can be considered as directly outgrown from the Dryopidae. They are in most of the characters as close to the larvae of the genera *Anchytarsus, Ptilodactylus* and *Eurypogon* as they are to the Dryopidae, and in the two essential characters, namely, the presence of ventral gills and the absence of a cloacal chamber, they are hardly as far remote from these three genera as they are from the Dryopidae.[1a]

Ptilodactyla serricollis Say and *Anchytarsus bicolor* Melsheimer.
(Plate VI and Plate VII.)

The larvae of *Ptilodactyla* and *Anchytarsus* are similar in form, namely, elongate cylindrical with a large, thick and fleshy tenth abdominal segment protruding from below the ninth tergite; the spiracles are typically bifore and there are nine pairs present, all laterally located. Thus these larvae appear rather isomorphous with the *Byrrhus* larva.

However, unlike this larva, they have only one ocellus, or two, very close together, on each side; the mandibles are simple with a stylus-like prostheca but without a long series of hair from a rudimental molar part, and above all, a maxillary articulating area is absent. In all of these important characters the larvae of *Ptilodactyla* and *Anchytarsus* agree with the Dryopidae and with the Psephenidae.

The diagnostic characters that separate them from both the Byrrhidae and the Dryopidae and Psephenidae are rendered by special features on the tenth abdominal segment, namely, a pair of cleft diverticles whose inner lobes are either simple and hairy as in *Ptilodactyla* (fig. H, plate VI) or carry a bunch of finger-shaped gills as in *Anchytarsus* (fig. f, plate VII).

[1a] After the completion of the present paper the U. S. National Museum has received from Professor James G. Needham the very valuable gift of a larva taken by him in Hang-chow, China, which in the general shape and the details is near to the larva of *Eurypogon* but possesses like the Psephenidae larva ventral gills below most of the abdominal segments. A second larva of the same unknown genus has also been received through the courtesy of Dr. Hugh M. Smith from Nakon, Sutamaret, Siam. This larval form thus sustains the above expressed opinion that the Psephenidae are more closely related to the *Anchytarsus = Ptilodactyla = Eurypogon* group than to the Dryopidae.

The jugular skin of these larvae (fig. F, plate VI) can be distended and puffed up by blood pressure, a remarkable display which is not seen in other beetle larvae except in those of the Cebrionidae (including the former family Plastoceridae).[2] In *Ptilodactyla* there are behind the spiracles of the mesothorax and the eighth abdominal segment small, normally retractile sacs, which also can become turgid and extended; in *Anchytarsus* no similar organs are found.

Eurypogon niger Melsheimer. (Plate VIII.)

The genus *Euryopogon* is in our present system placed next to *Anchytarsus.* Certainly its larva is close to the larva of this genus, but not as close as the larva of *Ptilodactyla* is to the one of *Anchytarsus.* Principally there are no diverticles extending from the tenth segment, which is completely bare (fig. F, plate VIII). Besides, the clypeus is fused with frons, labrum is short, and the antennae and the mentum are somewhat different from those of *Anchytarsus* and *Ptilodactyla.* In all of these characters the larva of *Eurypogon* agrees with the larva of the *Cebrionidae.*

The larvae we have discussed so far have rather few characters in common with the larvae of the following genera, *Heterocerus, Dascillus,* all the Helodinae-genera, and *Nosodendron.* These constitute together a natural, but isolated group, that we shall come to presently, but first it will be expedient to consider the larva of the family Chelonariidae, customarily placed in the series Dascilloidae.

Chelonarium lecontei Thomson. (Plate IX.)

The larva of *Chelonarium lecontei,* reared and preserved in the U. S. National Museum, at the first sight appears as closely approaching the Dryopidae larvae. It looks like a plump *Helmis* or *Dryops* larva beset with spinose hairs of the same type as in the Dermestidae. There is only one large ocellus on each side, and the ninth and tenth abdominal segments form a cloacal chamber, with the ventral surface of the tenth shaped and acting as a well fitting operculum.

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[2] J. A. Hyslop: The present status of the Plastoceridae. (Proc. Ent. Soc. Wash., vol. 25, 1923, pp. 156–160, one plate.)

However, a careful examination of the anatomical details will show characters such as the presence of multidentate mandibles, maxillae with distinctly two-jointed galea, short antennae and a cloacal chamber with a pair of bilobed diverticles (fig. J) and an unpaired tripartite soft appendix, but no real gills, whereby the *Chelonarium* larva comes as near to the Byrrhoid stock as do the larvae of *Ptilodactyla* and *Anchytarsus*.

Finally a very remarkable and unique shape of its spiracles (figs. A, D and H) may establish a transitory form between the ordinary bifore spiracles found both in the Byrrhoids and most of the Dryopoids, and the cribriform spiracles typical for the larvae of *Heterocerus* and *Dascillus*.

The spiracles of *Chelonarium* are present in the normal number of nine pairs; they are moderately large and placed on the underside of projecting tubercles situated laterally on the mesothorax and the first seven abdominal segments, but dorsally and paramedianly on the eighth. Unquestionably they are bifore, but the airtubes are bent to each side, in a line, and with winding serpentine slits; the spiracular opening is small and circular.

Heterocerus ventralis Melsheimer. (Plate X.)

The larva of *Heterocerus* is allied to the *Lara* and *Chelonarium* larvae but also to the more common type of coleopterous larvae found in the Byrrhidae. It has five ocelli on each side, the tergite on the ninth abdominal segment is large but not excavated below, there is no operculum, and no cloacal chamber. Anus (fig. F) is located in the upper part of the tenth abdominal segment immediately below the ninth abdominal tergite and, as in *Amphicyrta,* the rest of the segment is prolonged into an unpaired, digitiform and two-jointed projection. This projection is rather large, capable of protrusion and retraction, and its terminal portion is completely softskinned, carrying neither a single spine as in *Amphicyrta* nor two hooks as in *Lara*. There are no branchial filaments. The antenna is short and the distal joint minute, but the apical tactile appendix is comparatively large and balloon-shaped. The prothoracic episterna (h p fig. K) are strong and triangular with projecting front angles overlapping the basal corners of the cranium.

The development both of the antennae and the episterna is unusual, but the characters or rather combination of characters by which this genus is segregated taxonomically from the larvae hitherto considered are the possession of cribriform spiracles, (fig. M), mandibles (figs. H and J) with a strong projecting molar part and a strong accessory ventral condyle fitting into a hypopharynx (hx fig. L) provided with a transverse chitinization against which the molar parts work.

Dascillus davidsoni LeConte. (Plate XI.)

The same combination of principal characters which distinguish the larva of *Heterocerus* is also found in *Dascillus,* but of course each character in the combination differs to a certain degree according to the different environmental and biological conditions to which the two larvae are subjected. Thus in *Dascillus* the mandibles have stronger molar parts (figs. E and F), the hypopharyngeal chitinizations (hc fig. I) are more differentiated and both the mandibles and the hypopharyngeal chitinizations are asymmetrical, the cribriform spiracles (fig. G) are larger and the pores in the spiracular plate more distinct and regularly arranged.

The general appearance of the two larvae is not particularly different and both have somewhat chitinized, not plicate tergites. The ninth abdominal tergite of *Dascillus* is similar to that of *Heterocerus* but the tenth is much smaller, almost rudimental, and without a terminal soft prolongation. Also in other details, but all of minor taxonomic importance, the *Dascillus* larva is distinguished from the *Heterocerus* larva: The labrum (fig. A) is short, clypeus large, fused with frons, both labrum and clypeus asymmetrical, antennae (fig. H) long, ocelli absent, a distinct maxillary articulating area (a fig. D) is present, both lacinia and galea long and slender, ligula different in size and form.

The larvae of *Heterocerus* and *Dascillus* are closely related taxonomically and both are decidedly different from all the larvae hitherto discussed, but, like these, derived from the Byrrhidae. The appearance of a rudimental molar part in the *Byrrhus* larva is particularly significant, as is the maxillary articulating area occurring both in the Byrrhids and *Dascillus.* The cribriform spiracles of *Heterocerus* and *Dascillus* may have developed through an intermediate spiracular type corresponding to the one found in *Chelonarium.*

Nosodendron californicus Horn and *Nosodendron unicolor* Say. (Plate XXII.)

The affinities of *Nosodendron* have not yet been definitely established for the imaginal form of the genus. By some authors it has been placed near the Ostomidae and by others, for instance Leng in his Catalogue, as a subfamily of the Byrrhidae. Judging from the larva of *Nosodendron,* Leng is more nearly correct than the other authors, for there is hardly any connection between the *Nosodendron* larva and the Ostomid larva but unquestionably a rather close relationship between it and the Byrrhid larva. Thus the *Nosodendron* larva possesses six ocelli and a maxillary articulating area (a figs. G and O) just like the Byrrhid larva does. However, the *Heterocerus* larva has also six ocelli and both the *Heterocerus* and *Dascillus* larvae have a maxillary articulating area. Furthermore an inquiry into the finer anatomical details of the larva of *Nosodendron* reveals characters of fundamental taxonomic importance which are identical with the ones found in the *Heterocerus* and *Dascillus* larvae but not in the true Byrrhid larvae, namely, mandibles (fig. K) with a strong molar part and a strong accessory ventral condyle, and a hypopharynx (figs. P and Q) with conspicuous hypopharyngeal chitinizations. Therefore, according to the mentioned larvae, it is more consistent to place *Nosodendron* in the same series as *Heterocerus* and *Dascillus* rather than with the Byrrhidae.

This suggestion is supported by the presence in *Nosodendron* of characters not found in the Byrrhidae, and also to be sure not in *Heterocerus* or *Dascillus,* but in the larvae of the Helodinae which according to both imagines and larvae belong to the same series as *Dascillus.* These characters are: a broad ligula (li fig. O), a reduction almost to obliteration of the ninth and tenth abdominal segments (figs. A and I), and a location of a pair of large, well developed spiracles (figs. A and B) close together at the end of a particularly big and complete eighth abdominal segment that caps the end of the body. The other spiracles are also present and well developed but placed laterally in their tergites. All the spiracles are bifore and conform in this respect with the spiracles of the Byrrhidae and not with the cribriform spiracles of *Heterocerus* and *Dascillus.* In the Helodinae larvae the terminal spiracles are annualr and the other rudimental.

Prionocyphon discoideus Say. (Plate XIII.)

The larva of *Prionocyphon* which belongs to the Helodinae has, like the larvae of *Dascillus, Heterocerus* and *Nosodendron,* mandibles (fig. H) with a strong molar part and accessory ventral condyles (ac fig. H), and complete and well developed hypopharyngeal chitinizations (hc fig. F). Furthermore, it possesses a broad ligula, a large and terminal eighth abdominal segment (fig. E), very small, retractible and concealed ninth and tenth abdominal segments, and rudimental spiracles, except the eighth abdominal spiracles (8 Sp fig. D) which as mentioned are large and situated closely together below the end of the tergite to which they belong.

Other structures of interest, but of minor taxonomic importance, are the long, multiarticulate antennae (figs. B and E) which, however, according to Peyerimhoff[3] are organs of inconstant nature and apt to change into short, normally built antennae when the larvae are exposed to dry environments. There are five or six minute ocelli placed so closely together that they virtually are united into a single large eye on each side, and from the rudimental tenth segment, extending from above the anus, are three tassels of feather shaped gills (fig. C), which can be withdrawn into a pocket formed by the small terminal segments and situated inside of the eighth abdominal segment; but there is no cloacal chamber with a movable operculum as in the Dryopidae.

Eucinetus morio LeConte (?). (Plate XIV.)

The genus *Eucinetus* is according to the imagines placed as a subfamily of the Dascillidae, but judging from the larva the genus can not be placed with either the Dascilloidea or Dryopoidea. Unfortunately, the material on hand in the National Museum consists only of several cast larval skins, but the determination and probably also the rearing has been made by the very cautious and outstanding entomologist, the late Mr. H. G. Hubbard. Nevertheless, it should be emphasized that no definite record exists that imagines actually have been reared by him from the larval material preserved. Moreover, the old description and figures by Perris of *Eucinetus meridionalis* (Ann. Soc. Ent. France, series 2, vol. 9, 1851, pp. 48–53, pl. 2) do not agree with it. The association of the Hubbard larval material with the genus *Eucinetus* and the taxonomic discussion based on it should therefore be considered with proper reservation. The mandibles (figs. D and F) of this supposed *Eucinetus* larva have a molar part with a grinding surface of the type found in many Silphid larvae and also in many larvae of the Cucujoid type; the prostheca

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[3] P. De Peyerimhoff; Le double type larvaire de *Prionocyphon serricornis* Müll. Bull. Soc. Ent. France, 1913, pp. 148–151.)

is large, the distal part of the mandible is simple and narrow, the basal part broad. There are hypopharyngeal chitinizations (hx fig. H). The maxilla is very similar to that of *Derodontus* and has a mala only slightly divided (figs. B and G) into a low, soft, broad and indistinct galea and a pointed lacinia. The ninth and tenth abdominal segments (fig. E) are very simple, not different from the corresponding segments in many Cucujoid larvae, but entirely different from these segments in any of the Byrrhoid, Dryopid or Dascilloid larvae discussed.

In summarizing the taxonomic and phylogenetic results of our reasoning concerning the affinities of the genera which customarily have been placed in one of the two series Dascilloidea and Dryopoidea, we can now draw the conclusion that the larvae of these two series are derived from Byrrhoid ancestors. In common, the three series have the maxillary mala divided into a well defined lacinia and galea, and the galea is free, usually digitiform and often two-jointed. To be sure, these characters are not sufficent to separate them from the other series of beetle families, for instance from the Caraboidea, Staphylinoidea, Cucujoidea, etc. A diagnosis for this purpose, however, could readily be given, but to do so would be aside from our present plan.

The Byrrhoidea as here limited includes the subfamilies listed by Leng in the family Byrrhidae with exception of the Nosodendrinae. The larvae of the Byrrhoidea have a soft hypopharynx without chitinizations, a comparatively simple mandible without distinct molar part and with a long series of hairs at base, the maxillary articulating area is large, the spiracles bifore, the ocelli five or six on each side, and a cloacal chamber is absent.

The first of the two series derived from the Byrrhoidea includes the families Heteroceridae, Dascillidae, Nosodendridae and Helodidae. Of these families the Heteroceridae are according to the imagines listed in the Dryopoidea, the Nosodendridae in the Byrrhoidea and the Dascillidae and Helodidae in the Dascilloidea. Consequently the serial name "Dascilloidea" acquires a double meaning dependent upon whether we deal with larvae or imagines, but for the present it is deemed expedient to retain the old name.

In the series Dascilloidea the larvae possess a hypopharynx with distinct and strong chitinizations, the mandible has a large molar part, a maxillary articulating area is present. The families have either cribriform spiracles, all lateral, an eighth abdominal segment of normal form, and a large ninth abdominal segment, or, they have spiracles which are not cribriform, spiracles on the eighth abdominal segment which are terminal and close together, an eighth abdominal segment which is large and terminal and a rudimental ninth abdominal segment. The ocelli are, on each side six, one or none. A cloacal chamber with movable operculum is absent.

The second series derived from the Byrrhoidea includes five families, namely the Chelonariidae, Lariidae, Ptilodactylidae, Dryopidae and Psephenidae. Of these families the Chelodariidae have been listed according to the imagines in the Dascilloidea, the Lariidae in the Dryopoidea, the Ptilodactylidae in the Dascilloidea, the Dryopidae in the Drypopoidea, and one genus of the Psephenidae, namely *Psephenus,* in the Dryopoidea, another genus, *Eubrianax,* in the Dascilloidea. This series conforms no more than the former with the series named Dryopoidea in the classification of the imagines, but the old name will also be retained in the present case.

The larvae of the Dryopoidea have a hypopharynx without chitinizations, the mandible is simple, without molar part and without a long series of hairs at base, the maxillary articulating area is absent, the spiracles are bifore (exceptionally annular and then with most spiracles vestigial), there is only one ocellus on each side (except in *Lara* which has six ocelli), a cloacal chamber with movable operculum is present or absent.

Each of the five families of the Dryopoidea is characterized as follows:

The Chelonariidae have a very deviating type of bifore spiracles, the cloacal chamber is imperfect, no true gills, one ocellus.

The Lariidae have normal bifore spiracles, cloacal chamber imperfect, no gills, six ocelli.

The Ptilodactylidae, with three genera, *Ptilodactyla, Anchytarsus, Eurypogon,* formerly placed in the Dascilloidea, have bifore spiracles, no cloacal chamber, gills are present or absent, one ocellus.

The Dryopidae, with the genera *Pelonomus, Dryops, Helichus, Psephenoides, Stenelmis, Latelmis, Helmis, Limnius, Macronychus, Ancyronyx,* all placed formerly either in the Dryopidae or Helmidae, have bifore or annular spiracles, the cloacal chamber well developed, provided with operculum, gills present inside of the cloacal chamber, and one ocellus on each side.

The Psephenidae with *Psephenus* and *Eubrianax* (=*Placonycha*) have spiracles annular, cloacal chamber absent, gills present below first to fifth abdominal segments, one ocellus on each side.

The affinities existing between the *Eurypogon* larva and the larvae of the Cebrionidae have already been mentioned. There are Dryopoid characters also in the larvae of the Rhipiceridae and the Cardiophoridae, and it seems altogether plausible that the ancestors of the Elateridae are of Dryopoid stock. However, some phylogenetic connection may exist, some collateral derivation may be traced, between the Elateridae and the Ostomidae.

As a mere passing remark it may be indicated here that the larvae of the Cantharidae also have a double phylogenetic affiliation, namely with the Dryopoidea and the Melyridae.

The discovery of Verhoeff[4] that the larvae of the Lamellicornia have the essential systematic characters in common with the larva of *Dascillus,* is so well known that it only needs to be mentioned here. The isolation of the Lamellicornia, distinct in the imagines, is not apparent in the larvae and according to these the origin of the Lamellicornia from Dascilloid ancestors seems fairly definitely settled.

The Buprestidae are more logically derived directly from Byrrhoid-Dascilloid stock than indirectly through the Elateridae. The larva of *Rhaeboscelis,* discovered by Weiss and Nicolay and supposed (vide Leng's catalogue, p. 32) to be intermediate between the Elateridae and Buprestidae, is in every respect a true Buprestid larva.

The close affinities existing between the Byrrhoidea and the Cleroidea (including the Dermestidae, Melyridae, Cleridae and Ostomidae) have been discussed in Böving and Champlain's paper on North American Clerid larvae.[5]

It would be impossible in this address to give even a very brief account of the unpublished investigations made by my friend Dr. F. C. Craighead and myself of the bearing which the larvae have on the whole classification of the beetle families; but before I conclude I would like to present from this joint paper another example to prove the wisdom of Dr. Gahan's assertion that our final ideas about the classification of the Coleoptera will be influenced materially by the study of the larvae.

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[4] Beiträge zur Kenntnis der Coleopteren-Larven mit besonderer Berücksichtigung der Clavicornia von K. W. Verhoeff (Archiv. für Naturgeschichte, vol. 89, 1923, part A, pp. 48–63, figs. 72–86).

[5] In Proc. U. S. Nat. Mus., vol. 57, pp. 588–591, 1920.

We all know that the taxonomic positions of the Rhysodidae and the Cupedidae have been much discussed but without any final result. Lameere considered the Cupedidae as Adephaga of the most primitive type. Ganglbauer, de Peyerimhoff and d'Orchymont placed both the Rhysodidae and Cupedidae in the Adephaga. Kolbe (1908) placed the Rhysodidae in the Adephaga and included the Cupedidae as an isolated main division, named " Symphyogastra," in the suborder Polyphaga. Sharp and Muir placed the Rhysodidae in the Adephaga as a characteristic caraboid type and approximated the Cupedidae to the Byrrhoidea. Leng places with question mark the Rhysodidae as the first series of the Clavicornia, but adds, that he believes that the Rhysodidae is one of the nearly extinct branches of the primitive Coleoptera that originated while they still possessed characters now shared by the Adephaga; the Cupedidae he considers as modified survivors of an old polyphagous series and places them as a series, the Cupedoidea, close to the Lymexylonoidea. Imms in his "General Textbook of Entomology" (1924) follows Ganglbauer, de Peyerimhoff and d'Orchymont and considers both the Rhysodidae and the Cupedidae as separate families in the suborder Adephaga, so does Essig in " Insects of Western North America " (1926), and Tillyard in " Insects of Australia and New Zealand " (1926) raises the two groups to superfamily rank in the suborder Adephaga. Lastly Wm. T. M. Forbes in his paper on wing folding patterns of the Coleoptera (Journ. New York Ent. Soc., vol. 34, 1926) regards the Rhysodidae as a superfamily of Adephaga, the Rhysodoidea, and the Cupedidae and Micromalthidae as a suborder of Coleoptera, the Archostemata.

Clinidium sculptile Newman. (Plate XV.)

The larvae of the Adephaga are diagnosed by the following combination of characters: "Legs with tibia and tarsus separate, tarsus carrying one or two claws; labrum and clypeus fused together and with the frons to form a nasale; mandible without molar part; cardo small; hypopharynx without chitinizations; spiracles normally both present and annular." The larva of *Clinidium,* a genus of the Rhysodidae, agrees in full with this diagnosis and can without reservation be placed in the suborder Adephaga. However, it also possesses features which are particularly characteristic for it and definitely separate it from the larvae of all other adephagous families, namely, the presence of a prolonged epipharynx extending in front of nasale, partly retracted ventral mouthparts, maxilla with a rudimental lacinia only indicated by a long series of hairs and no galea, rudimental partly fused labial palpi, and a large spear-shaped gular plate. Combined, these characters define an adephagous series, the Rhysodoidea, that judging from their larvae is as distinct as the two other adephagous series, the Caraboidea and the Gyrinoidea, and constitutes a more typical adephagous series than the fourth series, the Paussoidea. The absence in *Clinidium* of ocelli and of urogomphi (= cerci auct.) is of slight taxonomic importance and are eliminations to be seen even in atypical larvae of the series Caraboidea.

Cupes concolor Westwood. (Plate XVI.)[6]

Cupes cannot be included in the suborder Adephaga according to the larva, nor does it ally with any of the Polyphaga, but it displays a combination of some characters only found in the larvae of the Adephaga, and some characters only found in the larvae of the Polyphaga. Thus the *Cupes* larva has legs with a separate tibia, tarsus, and claws, which is typical for all the Adephaga larvae. On the other hand, the *Cupes* larva has free labrum and clypeus, mandibles with a strong molar part, hypopharynx with heavy chitinizations, a large maxillary articulating area, a prominent and large lacinia and a free digitate galea, all characters which do not occur in the Adephaga but are present in many Polyphaga.

Features special for *Cupes* are a very projecting, broad and strongly chitinized ligula and an oval, cushioned lobe on each side of anus. The larva is blind, its body orthosomatic, fleshy, with dorsal and ventral ampullae, the tergum of ninth abdominal segment terminates with a conical, chitinized process, and the ninth sternum is small. All the spiracles are lateral and annular.

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[6] The larva of *Cupes concolor* described and figured first time, by T. E. Snyder (Proc. Ent. Soc. Wash., vol. XV, 1913, pp. 30–31, plate I.)

Micromalthus debilis LeConte. (Plate XVII.)[7]

The cerambycoid second and third stage larvae of *Micromalthus* possess all the diagnostic characters of *Cupes* except the taxonomically most important one, the mature *Micromalthus* larva being legless.

However, in the caraboid first larval stage *Micromalthus* possesses six-jointed legs each with distinct tibia, distinct tarsus and two claws. The tarsus moreover is much longer and slenderer than in *Cupes.* Both in the first stage larva and in the second and third stage larvae the end of the tergum of the ninth abdominal segment is prolonged, chitinized and bent down, and the ninth sternum is similarly prolonged but bent up so as to meet the tip of the tergum. In these stages the *Micromalthus* larva is very close to the *Cupes* larva; and together they form a group of very ancient and very specialized larval types. I can not see how we can escape giving to this group the rank of a suborder, the Archostemata Kolbe, as it can be joined neither with the Adephaga nor with the Polyphaga. It is noteworthy that Wm. T. M. Forbes in his above-mentioned important paper comes to the same conclusion from his investigation of the wing folding patterns of the imagines.

The larvae of the Lymexylonidae are nearer to the Archostemata larvae than to any other beetle larvae and may possibly have developed from a common ancestor.

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[7] H. S. Barber: Observations on the life history of *Micromalthus debilis* LeC. (Proc. Ent. Soc. Wash., vol. XV, 1913, pp. 31–38, plates II and III.)

H. S. Barber: The remarkable life history of a new family (Micromaltidae) of beetles. (Proc. Biol. Soc. Wash., vol. XXVI, 1913, pp. 185–190, plate IV.)

EXPLANATION OF PLATES[8]

PLATE I

Lara avara LeConte (?)

Fig. A. Dorsal view of larva.
Fig. B. Lateral view of larva.
Fig. C. Ventral view of larva.
Fig. D. Left maxilla, dorsal view.
Fig. E. Spiracle.
Fig. F. Right mandible.

PLATE II

Figs. A–E *Limnius troglodytes* Gyll.

Fig. A. Ventral view of larva.
Fig. B. Dorsal view of part of head.
Fig. C. Left mandible.
Fig. D. Right mandible—old and worn apically; lm, prostheca.
Fig. E. Ends of right maxilla and labium; ga, galea; lac, lacinia; li, ligula.

Figs. F–O *Helichus* sp.

Fig. F. Lateral view of larva.
Fig. G. Right mandible.
Fig. H. Dorsal view of larva.
Fig. I. Dorsal view of head.
Fig. J. Leg.
Fig. K. Ventral view of head; li, ligula, m, mentum; sm, submentum; ta, tentorium.
Fig. L. Ends of lacinia and galea viewed from buccal cavity.
Fig. M. Ventral view of end of abdomen, operculum removed.
Fig. N. Same as fig. M, with seventh abdominal segment and both operculum and tergum of ninth abdominal segment removed.
Fig. O. Ventral view of end of abdomen.

PLATE III

Figs. A–G *Cytilus alternatus* Say

Fig. A. Left mandible.

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[8] All figures drawn by Adam G. Böving with exception of the figures D, E, G, and J on plate VI and all the figures on plate VII and plate VIII, which have been made by J. A. Hyslop.

Fig. B. Right maxilla, ventral view; ca, cardo; mpf, maxillary palpifer.
Fig. C. Spiracle.
Fig. D. Antenna.
Fig. E. Labial palpi.
Fig. F. End of leg; ti, tibia.
Fig. G. Oblique ventral view of larva.

Figs. H–L *Amphicyrta chrysomelina* Erichson.

Fig. H. Lateral view of head.
Fig. I. Left mandible, ventral side.
Fig. J. Mouthparts viewed from the inside of the mouth; epx, epipharynx; hx, hypopharynx; ls, labium (= prementum); ma, maxilla; oe, oesophagus.
Fig. K. Ventral view of ventral mouthparts; a maxillary articulating area; g, gula; ls, labium (= prementum); m, mentum; sm, submentum.
Fig. L. Lateral view of ninth and tenth abdominal segments.

Figs. M–R *Lioon simplicipes* Mann.

Fig. M. Dorsal view of anterior portion of head.
Fig. N. Mouthparts viewed from the inside of the mouth; epx, epipharynx; hr, hypopharyngeal rod; hx, hypopharynx; li, ligula; lp, labial palpus; ls, labium (= prementum); m, mentum; sm, submentum; st, maxillary stipes.
Fig. O. Spiracle.
Fig. P. Lateral view of larva; mst, mesotergum; prt, protergum; sp, spiracle.
Fig. Q. Left mandible, ventral view.
Fig. R. Ventral view of ventral mouthparts; a, maxillary articulating area; gu, gula; ls, labium (= prementum); m, mentum; sm, submentum.

PLATE IV

Byrrhus fasciatus Forst.

Fig. A. Lateral view of larva.
Fig. B. Right mandible, ventral side.
Fig. C. Inner view of anterior part of head.
Fig. D. Antenna.
Fig. E. Right mandible, dorsal side.

Fig. F. Ventral view of ventral mouthparts; a, maxillary articulating area; gu, gula; li, ligula; ls, labium (= prementum); m, mentum; sm, submentum; tb, tentorial bridge.

Fig. G. Dorsal view of head.

Fig. H. Innerside of head with ventral mouthparts in dorsal view; ecr, epicranium; hb, hypopharyngeal transverse bracon; nc, superior ganglion of head; tb, tentorial bridge.

Fig. I. Lateral view of part of head from the outside; ecr, epicranium; hb, hypopharyngeal transverse bracon; hr, hypopharyngeal rod; hx, hypopharynx; li, ligula; lp, labial palp; m, mala (= lacinia and galea); mxp, maxillary palpiger; oe, oesophagus; st, maxillary stipes.

Fig. J. Left maxilla in dorsal view.

Fig. K. Lateral view of part of head from the outside, same as fig. I, but with maxilla removed; gu, gula; m, mentum; nc, superior ganglion of head; sm, submentum.

Fig. L. Left maxilla in ventral view; a, maxillary articulating area; ga, galea; la, lacinia.

PLATE V.

Figs. A–F *Eubrianax edwardsi* Lec.

Fig. A. Dorsal view of larva.

Fig. B. Right maxilla, ventral view; c, cardo; ga, galea; lac, lacinia; st, maxillary stipes.

Fig. C. Ventral view of part of head; c, cardo; lab, labrum; li, ligula; ls, labium (= prementum); m, mentum; ma, mala; st, maxillary stipes.

Fig. D. Left mandible, ventral view.

Fig. E. Left mandible, dorsal view.

Fig. F. Ventral view of larva.

Figs. G–O *Psephenus lecontei* LeC.

Fig. G. Ventral view of head; li, ligula; ls, labium (= prementum); m, mentum; sm, submentum.

Fig. H. Dorsal view of head.

Fig. I. Epipharynx; epr, epipharyngeal rod; o, eye from inside.

Fig. J. Maxilla and bottom of mouth cavity; li, ligula; pgn, paragnaths (= maxillulae).

Fig. K. Right maxilla.
Fig. L. Dorsal view of larva.
Fig. M. Left mandible, dorsal view.
Fig. N. Left mandible, ventral view.
Fig. O. Ventral view of larva.

Plate VI

Ptilodactyla serricollis Say

Fig. A. Dorsal view of head.
Fig. B. Ventral view of head; c, cardo; gs, gular suture; ls, labium (=prementum); m, mentum; sm, submentum; st, maxillary stipes.
Fig. C. Right mandible, dorsal view.
Fig. D. Right maxilla, dorsal view.
Fig. E. Right maxilla, ventral view.
Fig. F. Lateral view of anterior part of larva.
Fig. G. Spiracle.
Fig. H. Tenth abdominal segment, dorsal view.
Fig. I. Lateral view of larva.
Fig. J. Ninth abdominal segment, dorsal view.

Plate VII

Anchytarsus bicolor Melsh.

Fig. A. Lateral view of head.
Fig. B. Front view of head.
Fig. C. Ventral view of head.
Fig. D. Lateral view of end of abdomen.
Fig. E. Spiracle.
Fig. F. Dorsal view of larva.
Fig. G. Leg.
Fig. H. End of abdomen, ventral view.

Plate VIII

Eurypogon niger Melsh.

Fig. A. Antenna.
Fig. B. Lateral view of head.
Fig. C. Mandibles.
Fig. D. Ventral view of head.
Fig. E. Dorsal view of head.
Fig. F. End of abdomen, lateral view.
Fig. G. Dorsal view of larva.
Fig. H. Spiracle.

PLATE IX

Figs. A–T *Chelonarium* sp.

Fig. A. Spiracle of mesothorax.
Fig. B. Dorsal view of anterior part of head.
Fig. C. Left mandible.
Fig. D. Spiracle of second abdominal segment.
Fig. E. Spiracular trachea and spiracle, from inside.
Fig. F. Ventral view of ventral mouthparts.
Fig. G. Lateral view of larva.
Fig. H. Spiracle of eighth abdominal segment.
Fig. I. End of ninth abdominal segment, dorsal view.
Fig. J. Tenth abdominal segment, operculum with appendices on dorsal side.

Figs. K–N *Ancyronyx variegatus* Germar (?)

Fig. K. Lateral view of larva.
Fig. L. Spiracles of mesothorax and of first abdominal segment.
Fig. M. Lateral view of head.
Fig. N. Leg.
Fig. O. *Helmis pusilla* LeC. Dorsal view of larva.
Fig. P. *Helmis aeneus* Müller. Dorsal view of larva.
Fig. Q. *Dryops auriculatus* Geoffr. Lateral view of larva.

PLATE X.

Heterocerus ventralis Melsh.

Fig. A. Lateral view of larva.
Fig. B. Dorsal view of head.
Fig. C. Dorsal view of larva.
Fig. D. Antenna.
Fig. E. Epipharynx.
Fig. F. Tenth abdominal segment. Sagittal section to show anus and muscle inside of appendix.
Fig. G. Lateral view of anterior part of larva; hp, episternum of prothorax.
Fig. H. Left mandible, ventral view.
Fig. I. Left mandible, oblique dorsal view.
Fig. J. Ventral view of anterior part of larva; c, cardo; est, eusternum of prothorax; gu, gula; hp, episternum of prothorax; m, mentum; sm, submentum; stl, sternellum.

Fig. K. Ventral mouthparts, viewed from the buccal cavity; c, cardo; ga, galea; h, hypopharynx; lac, lacinia; st, maxillary stipes.
Fig. L. Tip of lacinia.
Fig. M. Spiracle.

PLATE XI

Dascillus davidsoni LeC.

Fig. A. Dorsal view of head.
Fig. B. Dorsal view of tergite of ninth abdominal segment.
Fig. C. Trochanter from below.
Fig. D. Ventral view of ventral side of head; a, maxillary articulating area; ca, cardo; gu, gula; hp, hypopleurum (= episternum and epimerum); li, ligula; ls, labium (= prementum); m, mentum; sm, submentum; st, maxillary stipes.
Fig. E. Left mandible, buccal face.
Fig. F. Left mandible, ventral view; ac, accessory ventral condyle.
Fig. G. Spiracle.
Fig. H. Lateral view of larva.
Fig. I. Head of larva, pulled to pieces to show mouthparts; ant, antenna; ca, cardo; epx, epipharynx with its chitinizations; hc, hypopharyngeal chitinizations; hp, hypopleurum; hx, hypopharynx; lab, labrum; li, ligula; lp, labial palpi; ls, labium (= prementum); m, mentum; ma, mala; md, mandible; pan, hypopharyngeal transverse bracon; sm, submentum; st, maxillary stipes.

PLATE XII

Figs. A–E *Nosodendron californicum* Horn

Fig. A. Dorsal view of eighth abdominal segment.
Fig. B. Spiracles of eighth abdominal segment.
Fig. C. Spiracle of second abdominal segment.
Fig. D. Lateral view of anterior part of larva (notice position of spiracle as compared with Fig. I.)
Fig. E. Ventral view of end of abdomen.

Figs. F–Q *Nosodendron unicolor* Say

Fig. F. Ventral view of right mandible.
Fig. G. Ventral view of right maxilla; a, maxillary articulating area; ga, galea; lac, lacinia.

Fig. H. Base of mandible from below.
Fig. I. Dorsal view of larva.
Fig. J. Ventral view of anterior part of larva.
Fig. K. Ventral view of right mandible and epipharynx.
Fig. L. Hypopharynx and ligula, lateral view; hb, hypopharyngeal bracon; hc, hypopharyngeal transverse chitinizations; hx, hypopharyngeal soft part; li, ligula; oe, oesophagus; pgn, paragnath (= maxillula).
Fig. M. Hypopharynx and ligula (legend as in figure N).
Fig. N. Right mandible, dorsal view.
Fig. O. Ventral mouthparts, ventral view; a, maxillary articulating area; c, cardo; ga, galea; lac, lacinia; li, ligula; ls, labium (= prementum); m, mentum; sm, submentum; st, stipes; ta, tentorium.
Fig. P. Innerside of hypopharyngeal chitinizations.
Fig. Q. Dorsal view of part of head.

PLATE XIII

Prionocyphon discoideus Say

Fig. A. End of abdomen, ventral view.
Fig. B. Lateral view of larva.
Fig. C. Tassels of gills.
Fig. D. End of abdomen, lateral view, diagram; ac, alimentary canal; 8 sp, spiracle of eighth abdominal segment.
Fig. E. Dorsal view of larva.
Fig. F. Innerside of mouth; ga, galea; hb, hypopharyngeal transverse bracon; hc, hypopharyngeal chitinizations; hx, hypopharyngeal soft part; la, lacinia; li, ligula; pgn, paragnaths (= maxillulae).
Fig. G. Ventral mouthparts, ventral view.
Fig. H. Mandible and epipharynx; ac, accessory ventral condyle.

PLATE XIV

(*Eucinetus morio* LeC.?)

Fig. A. Dorsal view of head.
Fig. B. Ventral view of head; a, maxillary articulating area; c, cardo; li, ligula; m, mentum; sm, submentum; st, stipes.
Fig. C. Lateral view of head.
Fig. D. Right mandible, ventral view; ac, accessory ventral condyle; mo, molar part; vc, ventral condyle.

Fig. E. Lateral view of body of larva, cast skin.

Fig. F. Ventral view of left mandible; ac, accessory ventral condyle.

Fig. G. Tip of lacinia and galea.

Fig. H. Hypopharynx; hb, hypopharyngeal bracon; hx, hypopharyngeal chitinization; pgn, paragnaths (= maxillulae).

PLATE XV

Clinidium sculptile Newm.

Fig. A. Dorsal view of head; epx, protruding epipharynx.

Fig. B. Right mandible, ventral view.

Fig. C. Right mandible, dorsal view.

Fig. D. Ventral side of head; a, maxillary articulating area with a sclerite; am, basal membrane of antenna; c, cardo; gu, gular plate; hy, hypostoma; li, ligula; ls, labium (= prementum); m, mentum; pst, presternum of prothorax; st, stipes maxillae; tp, tentorial pit.

Fig. E. Lateral view of larva.

Fig. F. Ventral mouthparts, dorsal view; a, maxillary articulating area; c, cardo; ecr, epicranium; laci, lacinia indicated by a row of hairs; li, ligula fused with rudimental labial palpi; md, socket for mandible; oe, oesophagus; st, stipes; ta, tentorial arm; tp, tentorial pit.

Fig. G. Dorsal view of part of abdominal tergum.

Fig. H. Leg; c, coxa; cl, claw; fe, femur; hp, hypopleurum (= episternum and epimerum); t, tarsus; tr, trochanter.

Fig. I. Ventral view of anterior part of larva; post, poststernellum; pst 1, presternum of prothorax; pst 2, presternum of mesothorax.

Fig. J. Spiracle.

PLATE XVI

Cupes concolor Westw.

Fig. A. Dorsal view of head.

Fig. B. Mandible with strong molar part.

Fig. C. Dorsal view of lower part of head with mouthparts.

Fig. D. Spiracle.

Fig. E. Lateral view of larva.

Fig. F. Ventral view of end of abdomen; stern 8, sternum of eighth abdominal segment.

Fig. G. Ventral view of anterior part of larva; cl, claw; f, femur; ta, tarsus; ti, tibia.

Plate XVII

Micromalthus debilis LeC.

Figs. A–H Cerambycoid, legless second stage larva.

Fig. A. Dorsal view of head.

Fig. B. Ventral view of right maxilla; a, maxillary articulating area; c, cardo; ga, galea; lac, lacinia; mpf, maxillary palpifer.

Fig. C. Ventral view of head; hb, hypopharyngeal bracon; li, ligula.

Fig. D. Right mandible; mo, molar part.

Fig. E. Hypopharynx and ligula in dorsal view; hb, hypopharyngeal bracon; hx, hypopharyngeal chitinization; li, ligula.

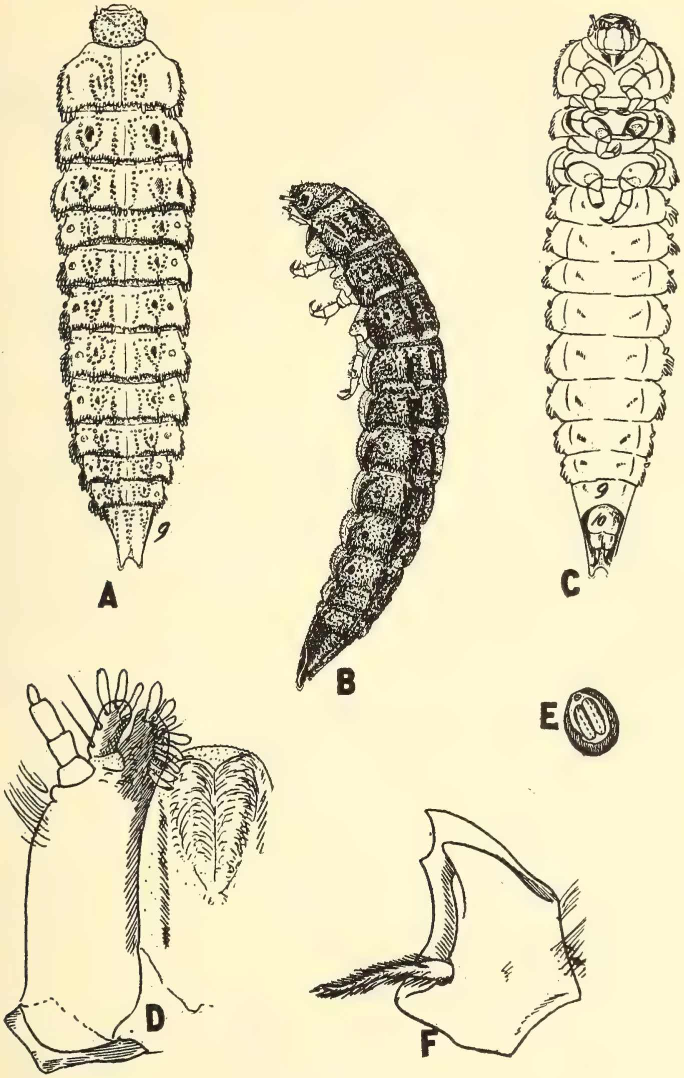
Fig. F. Hypopharynx and labium, lateral view.

Fig. G. Lateral view of legless, second larva; ur, urogomphus (=cerci auct).

Fig. H. Ventral view of end of abdomen.

Fig. I. Spiracle.

Fig. J. Caraboid, legged first stage larva.
Leg; cl, claw; ta, tarsus; ti, tibia.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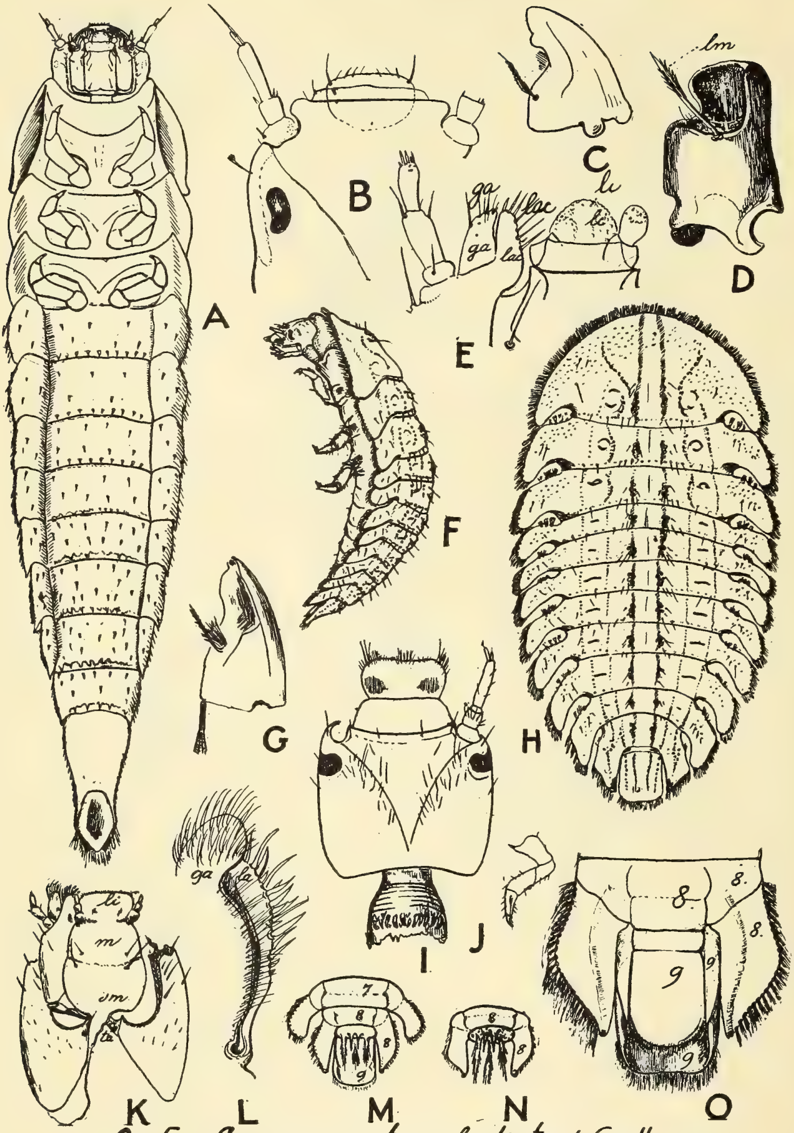
(Lara avara Lec)?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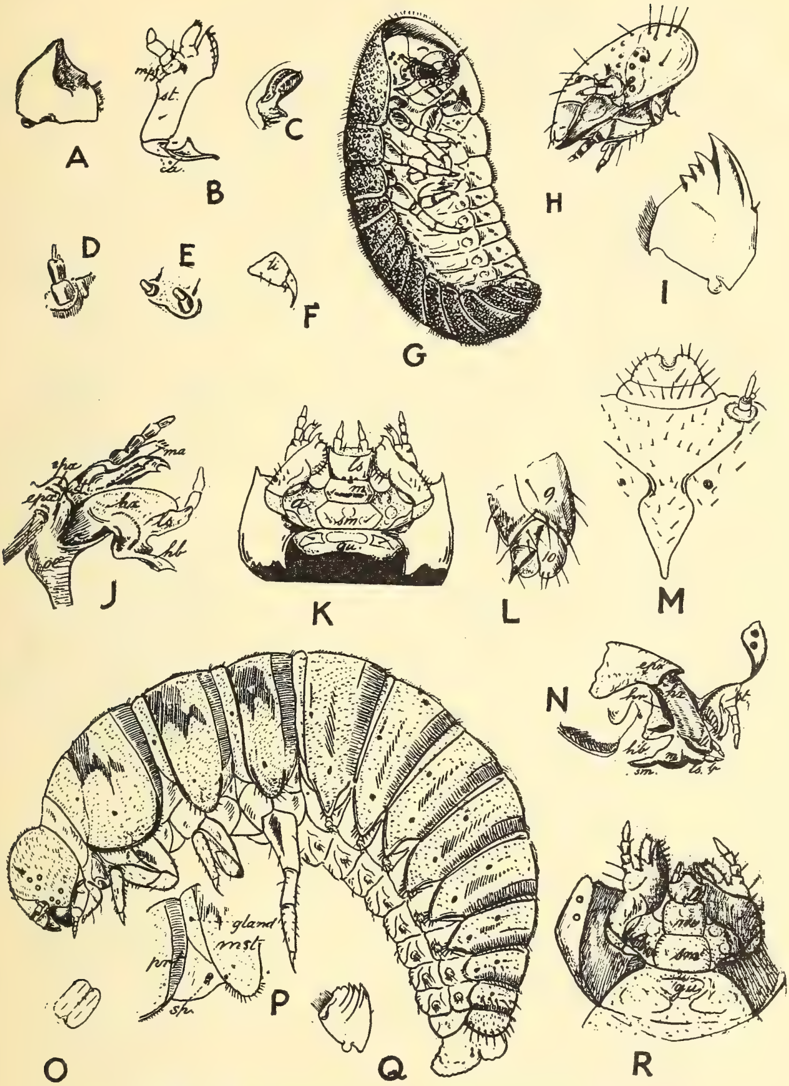
A-E Limnius troglodytes Gyll. Europe
F-O Helichus sp N.Amer.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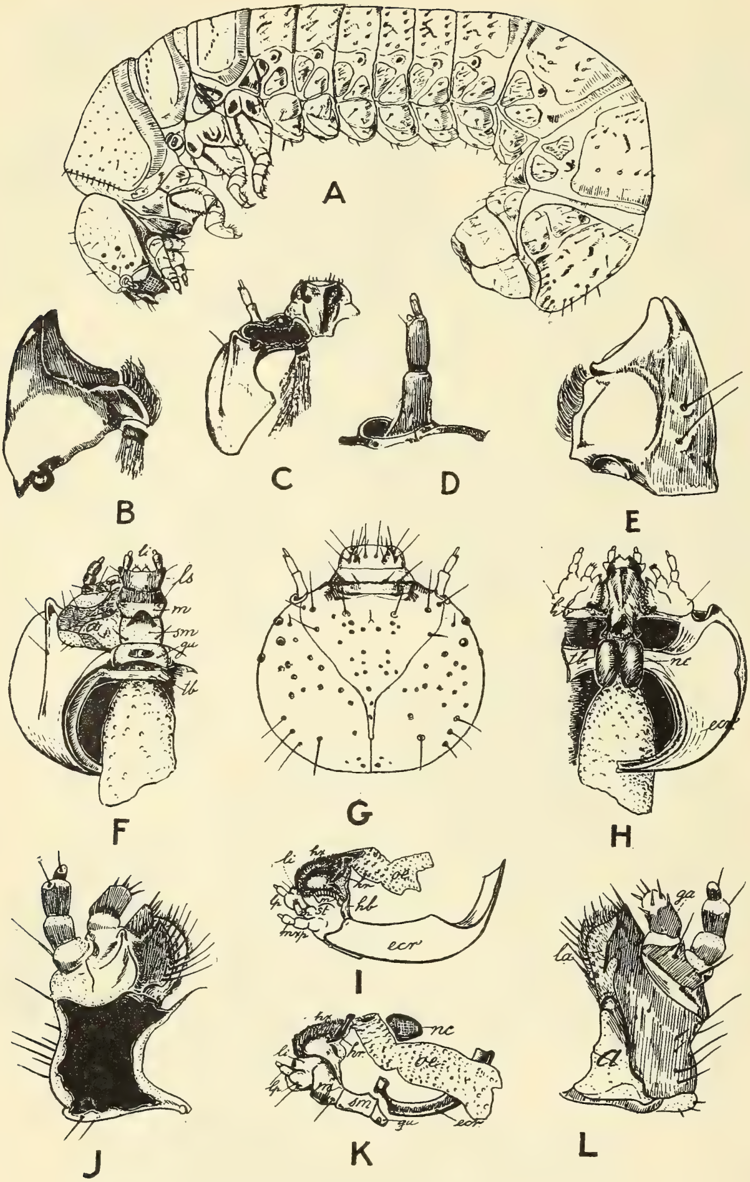
A-G Cytilus alternatus Say
H-L Amphicyrta chrysomelina Er.
M-R Lioon simplicipes Mann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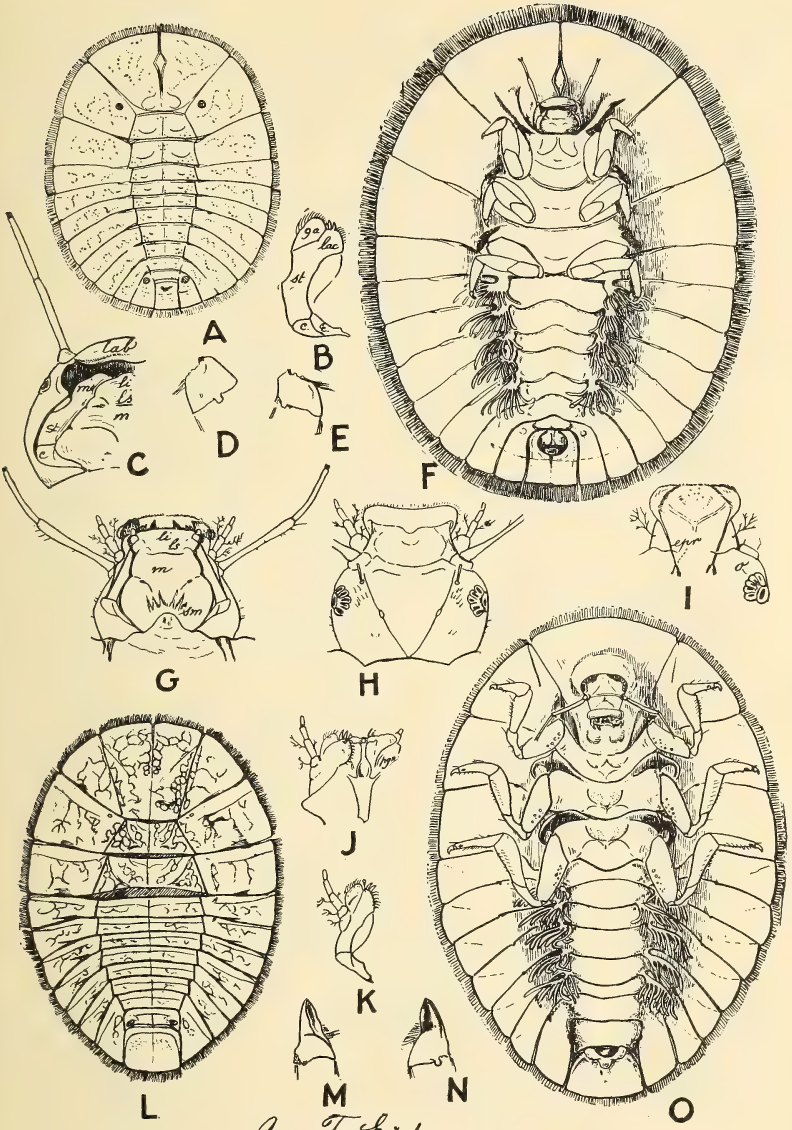
Byrrhus fasciatus. Forst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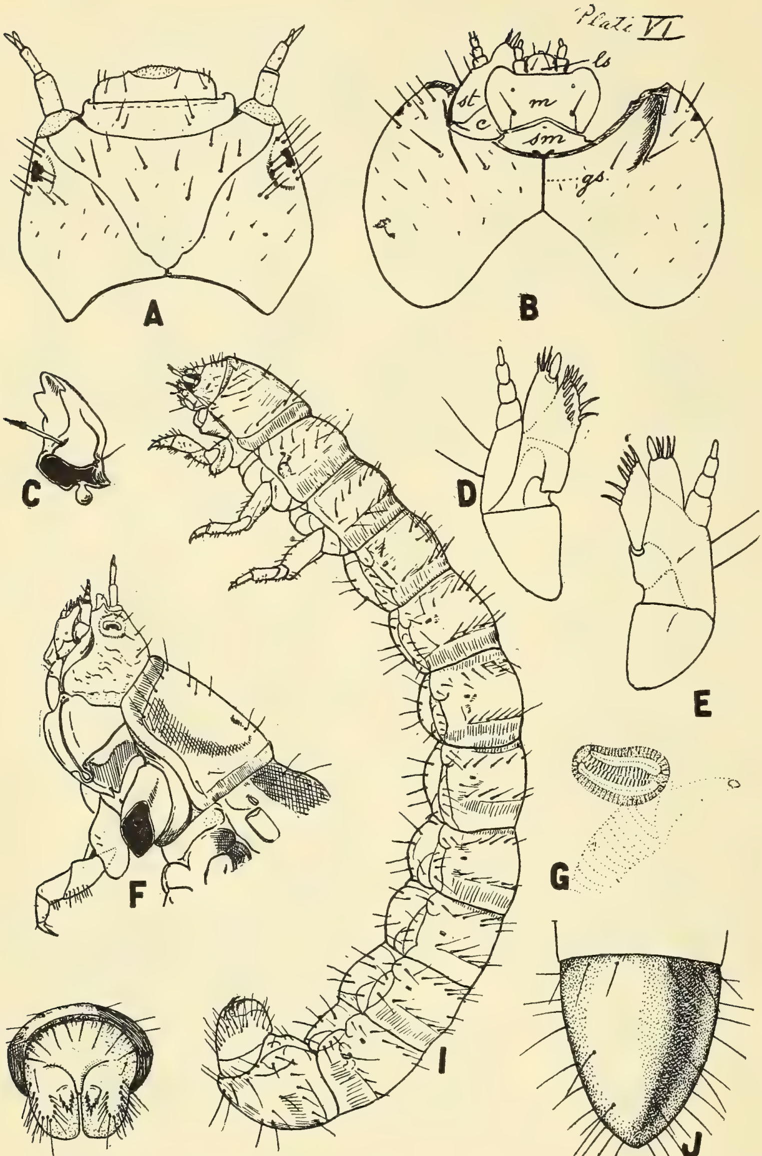
A-F: Eubrianax edwardsi Lec.
G-O Psephenus lecontei Lec.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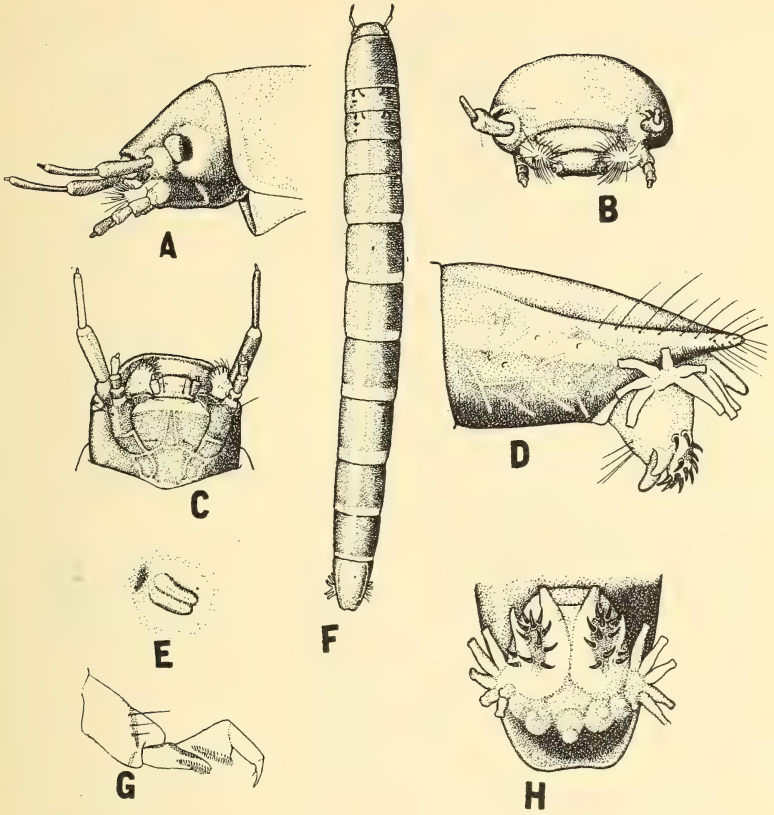
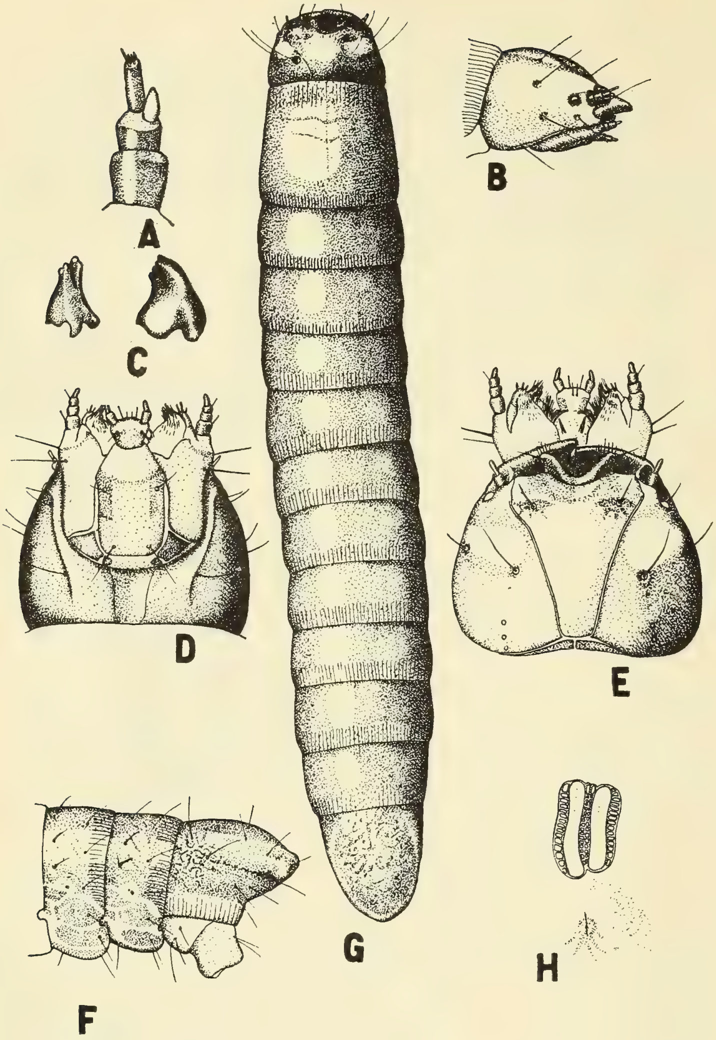
Ptilodactyla serricollis Say



Anchytarsus bicolor Melsh.

J. A. Hyslop del

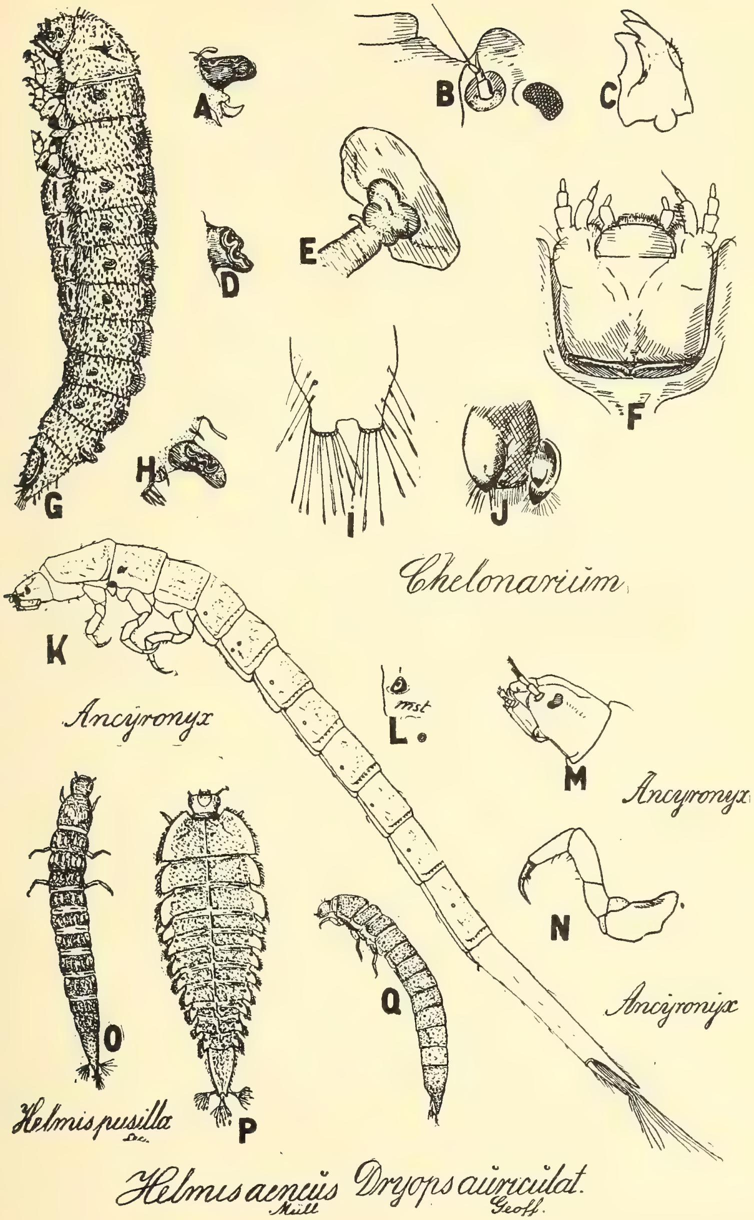
Plate VIII



Eurypogon niger Melsh.

J A Hyslop del.

PLATE IX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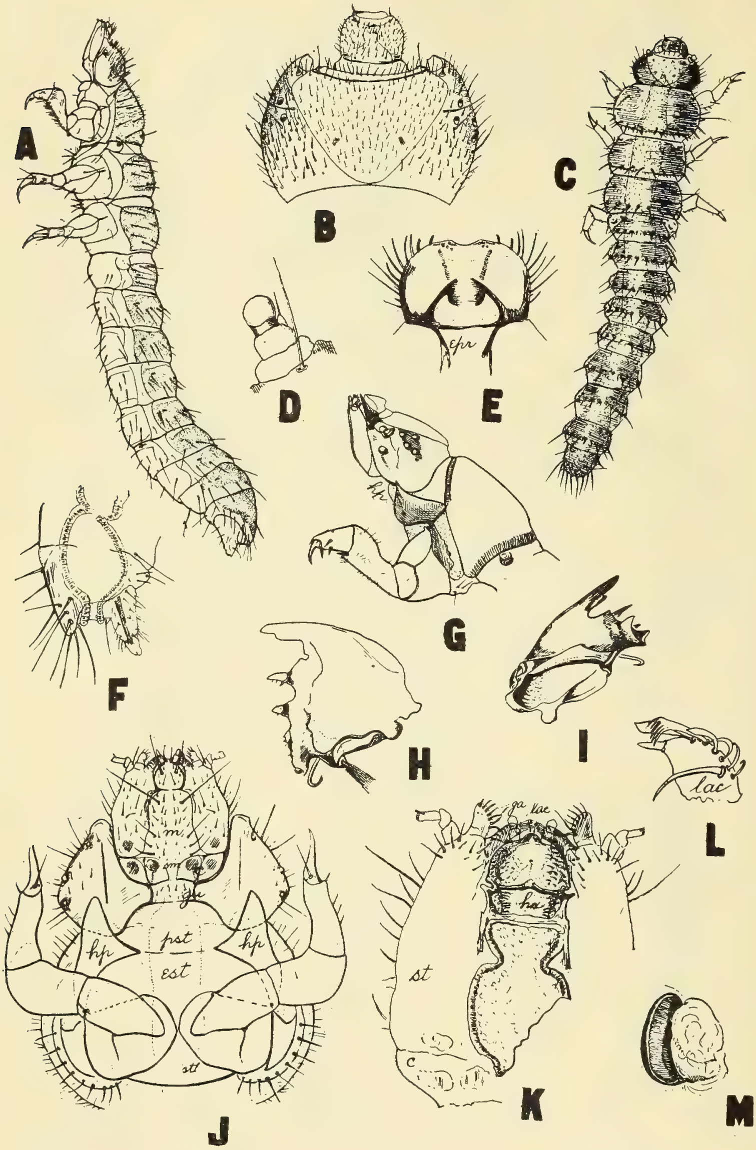
Helmis aeneus Müll
Dryops auriculat. Geoff.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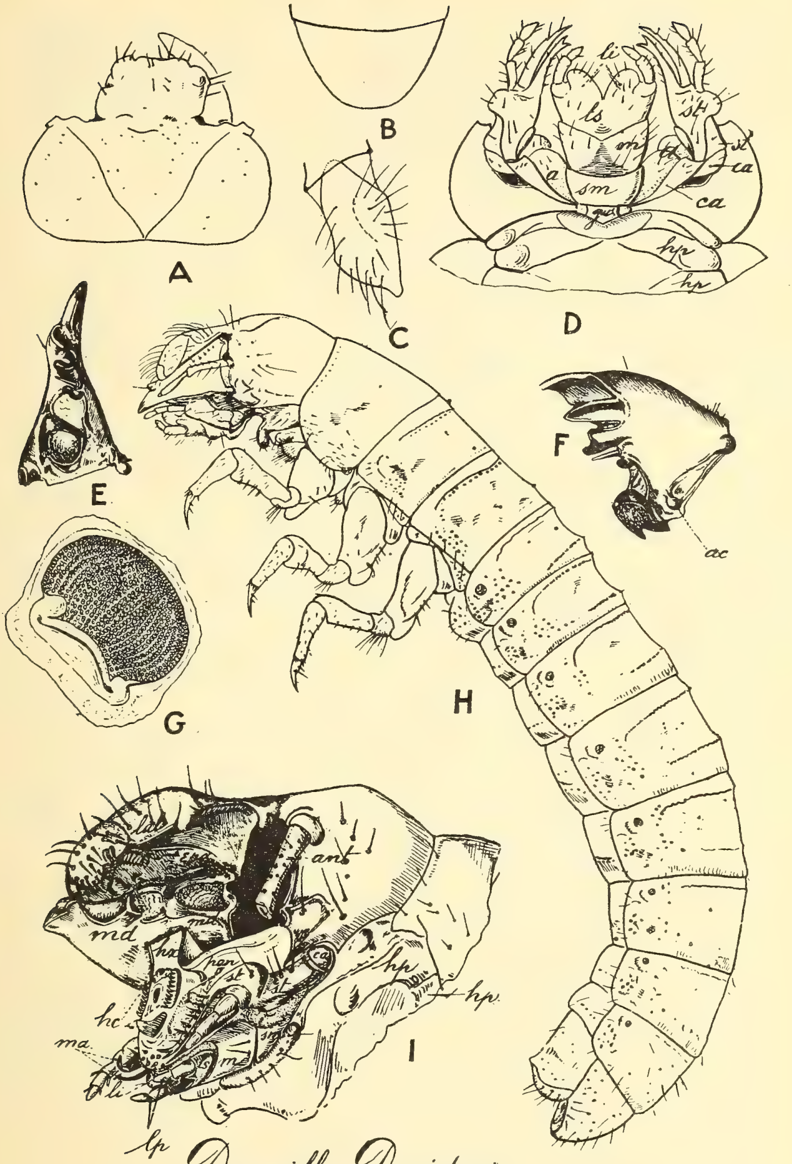
Heterocerus ventralis Melsh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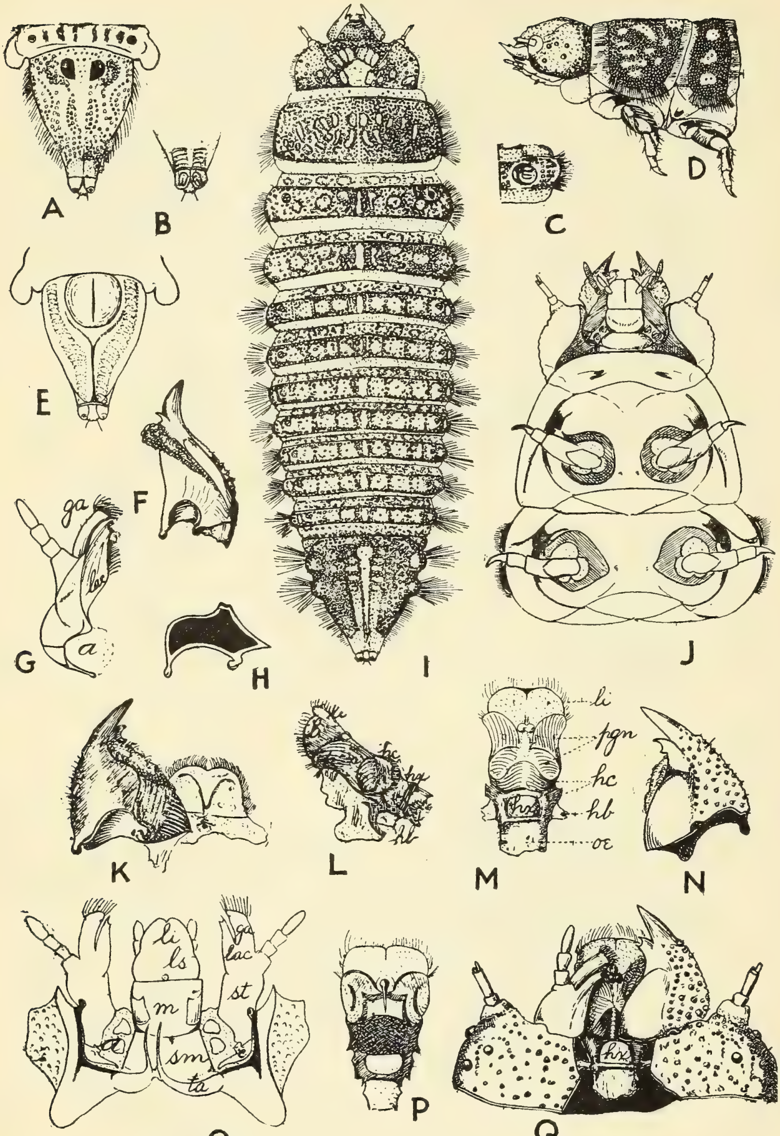
Dascillus Davidsoni Lec.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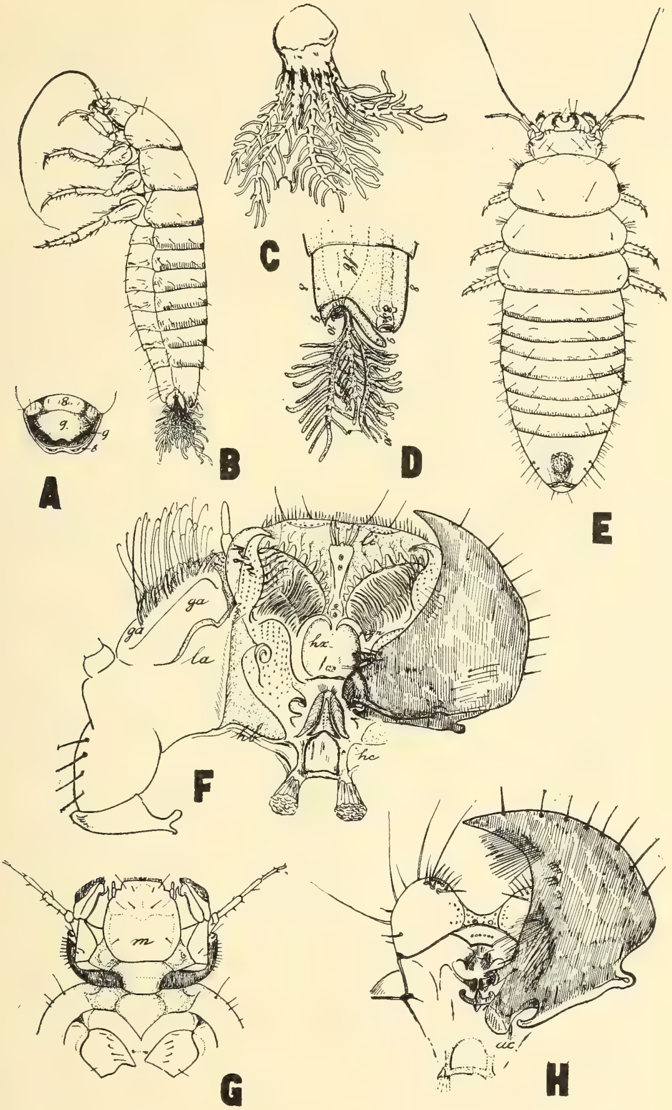
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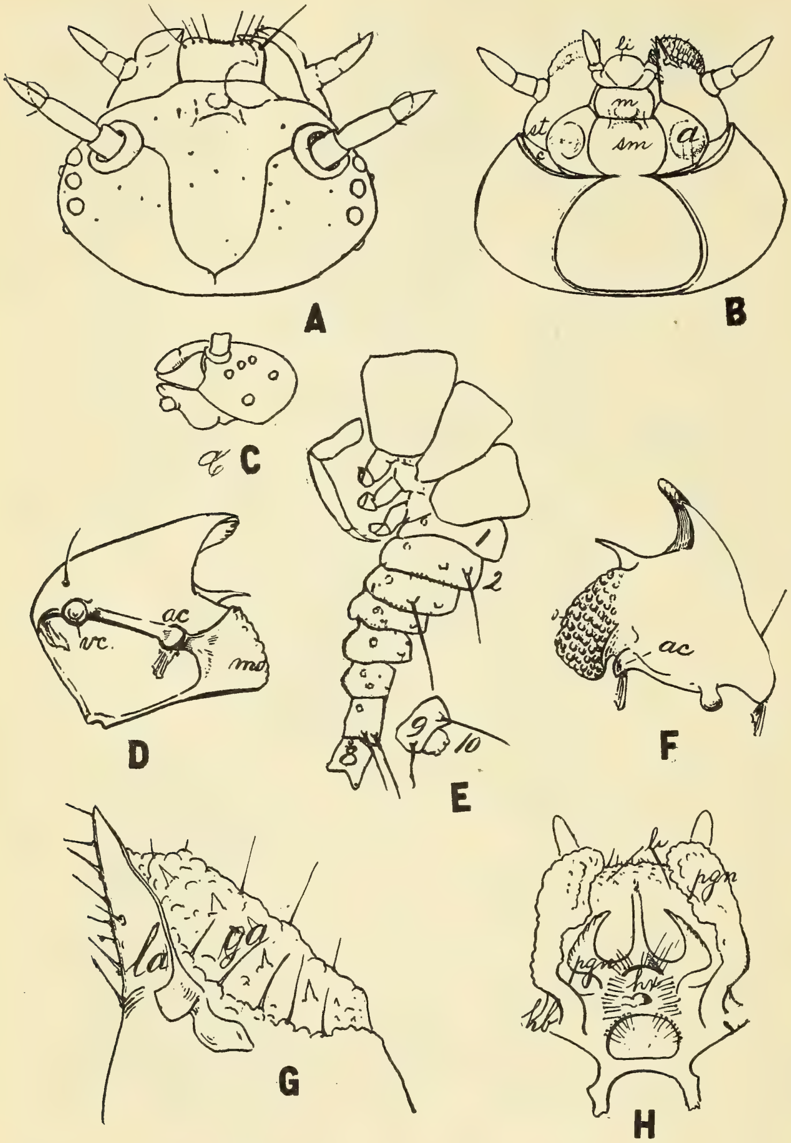
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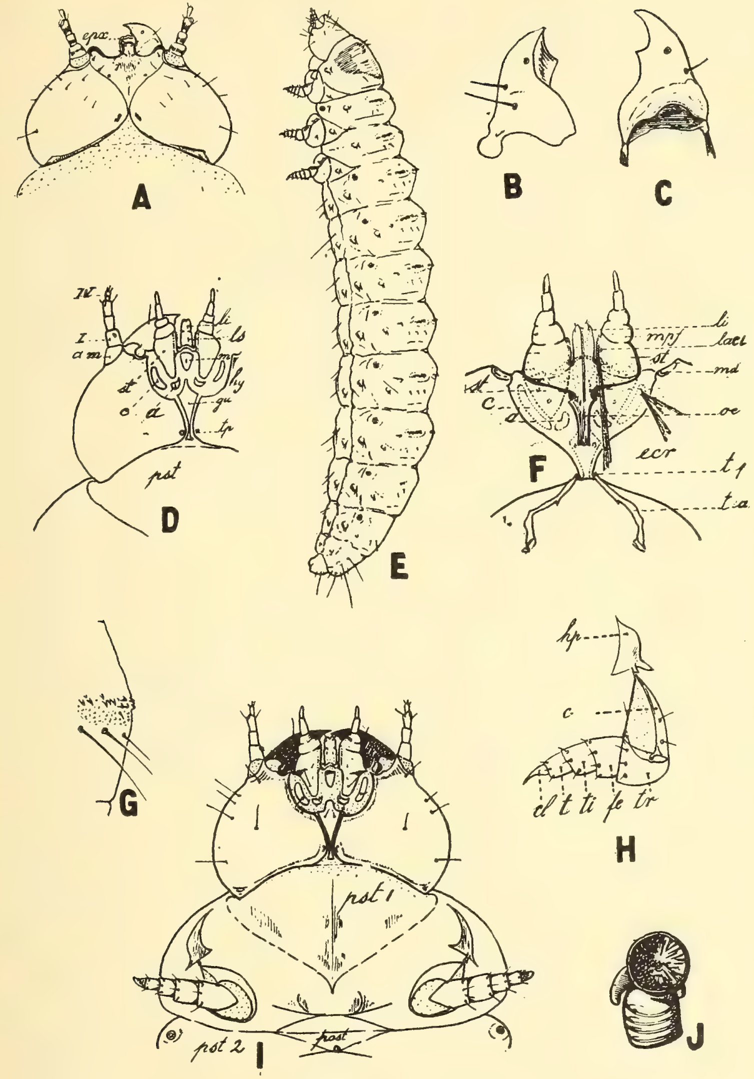
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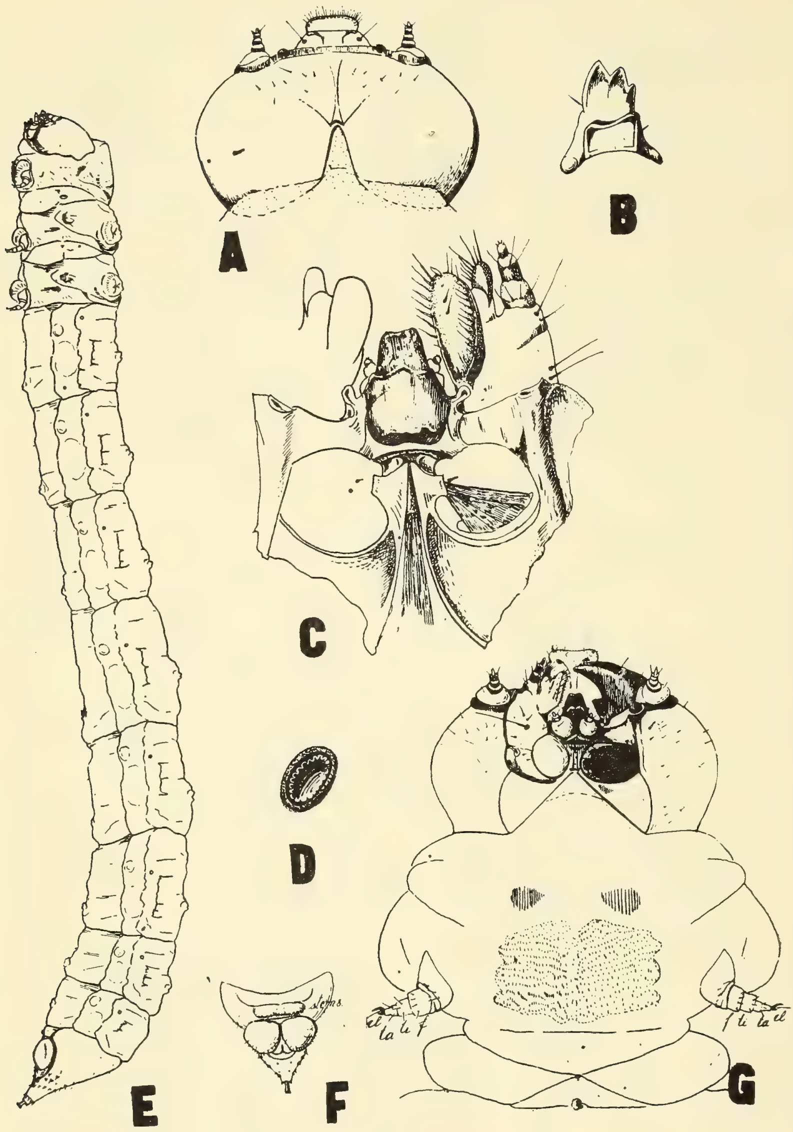
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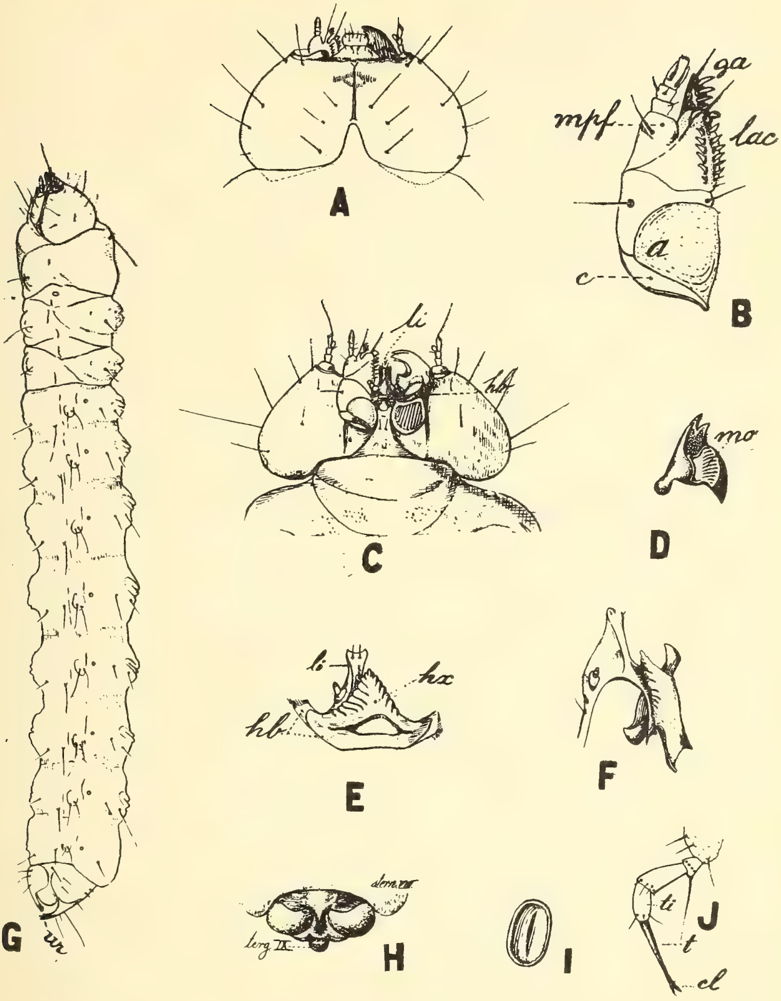
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PRESENT TRENDS IN SYSTEMATIC ENTOMOLOGY.—DESCRIPTIONS.*

By J. Bequaert, Department of Tropical Medicine, Harvard Medical School.

If a layman were at any time to enter the inner sanctum of the entomologist, most likely he would find him poring over some highly technical printed matter, trying to fit its contents to some enigmatic insect; or maybe he would find him struggling enthusiastically with the description of a much-prized "new species." In either case the layman would be strengthened in his estimate of the entomologist as a poor human absorbed in trivialities and to whom the broader aspects of the Universe are of no moment. For the amount of time the earnest student of insects devotes to "descriptions" is truly amazing and, I may add, rather dismaying to many serious minds. It behooves us then to drop our books and collections at times and turn our thoughts to the why and how of descriptive Entomology.

Is Descriptive Work Worthwhile?

To most of those present here this query must seem preposterous. However, we all know the Biologist with the superior air who dumps upon us boxes of insects, as a rule poorly collected, with the request that we "name" them for one of his own "important" papers;—but gives no thought for the time it may take to thus assist him nor appreciation for the knowledge it requires from the entomologist. Yet, if he stopped to think, our Biologist could readily see that the ultimate value of his own work will in many cases depend upon the correct identification of his specimens. Even some of the laboratory-bred anatomists are no longer satisfied with studying the embryology of "the wasp" or "the ant." They have found out that it may matter which particular species, or even race, they happen to have under the microtome.

Whether we like it or not, the progress of Biology as a whole remains closely correlated with the condition—either satisfactory or wretched—of descriptive taxonomy. Nevertheless, if descriptions had no further purpose than to define correctly the names of animals and plants, for use in other lines of biological work, I for one would not care to devote my time to reading and writing descriptions, however much this occupation might cater to the collector's mania that lurks in every one of us. I do not regard the drawing up of what Huxley has called "handy reference catalogues" as *per se* a justification of purely descriptive work. Let us look at the additional reasons why descriptive taxonomy should rightly be regarded as one of the most important branches of Biology.

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* Read as part of a symposium at the New York meeting of the Entomological Society of America, December 27, 1928.

The foremost *"raison d'être,"* or purpose, of descriptive Biology, *viz.* that of serving as a solid base to a *natural* classification, or what Professor W. E. Ritter has called a *synoptic* classification, I can only allude to. For it is a vast and intricate subject that I could not do justice to in the few minutes at my disposal. I was somewhat surprised to see that "classification" was not chosen as one of the main topics for this discussion of the present trends in systematic Entomology. Perhaps the promoters of the Symposium felt, wisely, that it was too vast an undertaking. I must then be contented with reminding you that unless accurate and exhaustive descriptions of most of the species are available, no satisfactory natural classification of any group of insects can be hoped for.

While a natural classification, of course, aims at expressing the genetic relationship as shown by the structure of the several species, it must also take into account the available facts of geographical distribtution and of paleontology. The importance of thorough descriptive work for the recognition of true relationship, for the solving of problems of distribution, and for the correct interpretation of fossil insects is obvious enough.

I prefer to dwell more at length upon a side of the question too often overlooked by taxonomists and teachers, *viz.* the *didactic* and *heuristic* value of descriptive taxonomy. It is a truism that all real Natural History is based upon unbiased observation. This requires an impersonal, or dispassionate, attitude of the mind which, I believe, is most easily acquired by describing animals and plants. Especially if the description is aided by drawing, the student is forced to focus his attention upon the object. He will be astounded to discover how many details can escape a cursory examination. While sharpening his powers of observation, he will learn to distrust his eyes and even at times to call in outside help to ascertain whether or not his senses are deceiving him. It is my conviction that every young entomologist, whatever his future line of interest may be, would profit immensely by including some earnest descriptive work in his training.

DESIDERATA OF DESCRIPTIVE WORK.

I frankly confess that I am by no means satisfied with the present trend of descriptive Entomology. The prevailing tendency is obvisously toward mass production rather than quality. One could readily mention groups of insects that are the despair of the student because certain leading specialists have developed the habit of describing so many new species a day. Two main motives seem to prompt the species-mongers. There is first the belief that every variation, ever so slight, that comes into their hands must be tagged with a name. In order to give the name a "standing" in nomenclature, it must as quickly as possible be published with a few supposedly descriptive phrases. It is so much easier, anyway, to describe an insect as new than to attempt to recognize it among the published descriptions. The second cause of slovenly work is the idolatry of type specimens to which so many of us have subjected ourselves. Specialists who are in charge of extensive collections—or who own them privately—sometimes feel that descriptions matter little since they themselves can at any time compare their types. I have a suspicion that some specialists never read their own descriptions.

But there is little inspiration or profit in deploring the low standard set by so much of descriptive Entomology. Let us rather cast about for some descriptions that may be held up as examples to emulate. In order to avoid invidious comparisons, I shall choose these models from the work of two entomologists no longer living. The first is the German dipterist Christian Rudolph Wilhelm Wiedemann, whose two volumes on exotic Diptera appeared just one hundred years ago (1828). I have often marveled at the correct and adequate descriptions contained in this work, which was written with very little comparative material and without the mechanical devices that now seem to us indispensable. A few weeks ago I received from South Africa a nemestrinid fly that turned out to be a species described by Wiedemann and never seen since. I had no difficulty whatever in recognizing it from the description. For my second illustration I return to more recent times, calling attention to the beautiful papers on Hymenoptera written by the Austrian entomologist Franz Friderich Kohl, who died four years ago (1924). With many other hymenopterists I regard Kohl's work—which was entirely taxonomic—as the very best that has been produced in descriptive Entomology. His method should be studied by every young entomologist, for it enables one to describe a species without ambiguity, so that it can be recognized by others from the description alone and without the help of the type.

WHAT THEN ARE THE REQUISITES OF A GOOD DESCRIPTION?

In the first place the description should be reasonably complete. It should not merely contain a few of the characters that in the author's opinion separate it from some of the other species with which he is acquainted. Quite to the contrary, it should present a complete account of all peculiarities that may be required by future workers. I have found in my own work that the majority of published descriptions are too short, not including characters of prime importance. Even the absence of certain peculiarities should be expressly mentioned.

In the second place, descriptions should be both accurate and clear. The complexity of insect morphology, of course, makes technicalities unavoidable. Yet there is an unfortunate tendency among entomologists to coin new terms for structures that have been defined by their predecessors. We even have had attempts at using well-established technical words with an entirely new meaning. The widespread fad of calling old things by new names should be kept out of Entomology. It is perhaps in the nomenclature of the wings of insects that these perpetual changes have done most harm. In the Diptera, for instance, we are slowly coming to the point where every author has his own terminology for cells and veins, so that too often his descriptions are puzzles to his fellow-workers. In the Hymenoptera conditions are not quite as bad and, moreover, we have for this order an excellent paper by Rohwer and Gahan condensing and defining the names of cells and veins used by various authors. I also wish to protest against the abuse of abbreviations, which tends to become a serious menace. Some people evidently believe that typographical imitation of mathematical formulae will automatically give mathematical precision to their descriptions. All of us who inflict descriptions upon our colleagues should remember Dr. F. E. Lutz's saying that "type is cheaper than time."

Finally, descriptions should be comparative or analytic. At the first International Entomological Congress, held at Brussels in 1910, Professor A. Lameere said: "Isolated descriptions that are not comparative, should be absolutely forbidden: the time has come for coordination." I endorse this statement without reservations. The prevailing practice of describing specimens merely because they cannot be given a valid name in the collection, should be discouraged. It is greatly to be regretted that this frivolous type of taxonomic work is often sponsored by large museums, where monographic revisons of permanent value could be more easily carried out and published than anywhere else.

In conclusion, I should like to warn all young entomologists who engage in descriptive work, to go slowly and to resist any urge to get into print in the shortest possible time. Let them beware of following the example of some of their elders, who are being carried away by "writer's itch." They should remember the saying of an obscure French poet that "time respects not that which one attempts to do without it."

FOOD-PLANT OF CHRYSOPHANUS HELLOIDES BDR. (LEPIDOPTERA).

By John D. Ritchie, Earl Grey, Saskatchewan, Can.

Perhaps the commonest species of the larger Lycaeniids in this district is *Chrysophanus helloides* Bois. This insect is on the wing from the latter part of July until the middle of September.

On September 13, 1924, while cutting wheat, I noticed several of the adults flying around in the vicinity of a slough and made up my mind to try and locate their food-plant. Accordingly, on the following Sunday I visited this place and after watching for some time perceived one specimen glide down among some tall grass and light on the leaf of a plant. On examining these plants I found several empty chrysalids on the under sides of the leaves and on further searching was fortunate in finding six chrysalids, which had not yet emerged and also one larva in the act of pupating. They proved on emergence to be the above species. Later I found a few more unemerged chrysalids and forwarded them, along with the food-plant, to Mr. J. J. De Gryse, at the Entomological Laboratory at Indian Head, Sask. Mr. De Gryse was unable to get the plant determined, on account of the absence of flowers. The plant is a Polygonum. As to the exact species I am uncertain but believe it to be *P. Hartwrightii* Gray.

Every year since 1914 I have reared these insects from the larvae and so far have been unable to find any other plant on which the larvae feed, although there are two other species of Polygonum growing here; the caterpillars refuse to accept them as food. Perhaps the particular plant above mentioned will prove to be this insect's exclusive food-plant.

The males of this species outnumber the females ten to one and are much smaller than the females. Holland, in his Butterfly-book, has very aptly described both sexes. The female is well illustrated on Plate XXVIII, but the male is much too light colored.

Correction to a Revision of Podabrus.—On page 80, Vol. VIII, No. 2, of Entomologica Americana, two species are described under the title *Podabrus nothoides* Lee. The second title should read *Podabrus basilaris* Say.—H. C. Fall.

JACOB DOLL.

The Brooklyn Entomological Society records with deepest regret the death of its Honorary Member, Jacob Doll, on February 10, 1929, at the age of 82.

An active member since 1880, Mr. Doll has been regular in his attendance at the meetings and always could be depended upon for interesting contributions to the scientific discussions, based on his experiences and recollections of so long a life. Mr. Doll also has been an Honorary Member of the Newark Entomological Society and an Active Member of the New York Entomological Society.

He served as Curator of Lepidoptera in the Brooklyn Museum from 1898 to his retirement in 1927. He was a veteran of the Civil War and a member of Hamilton Post, G. A. R., of Brooklyn.

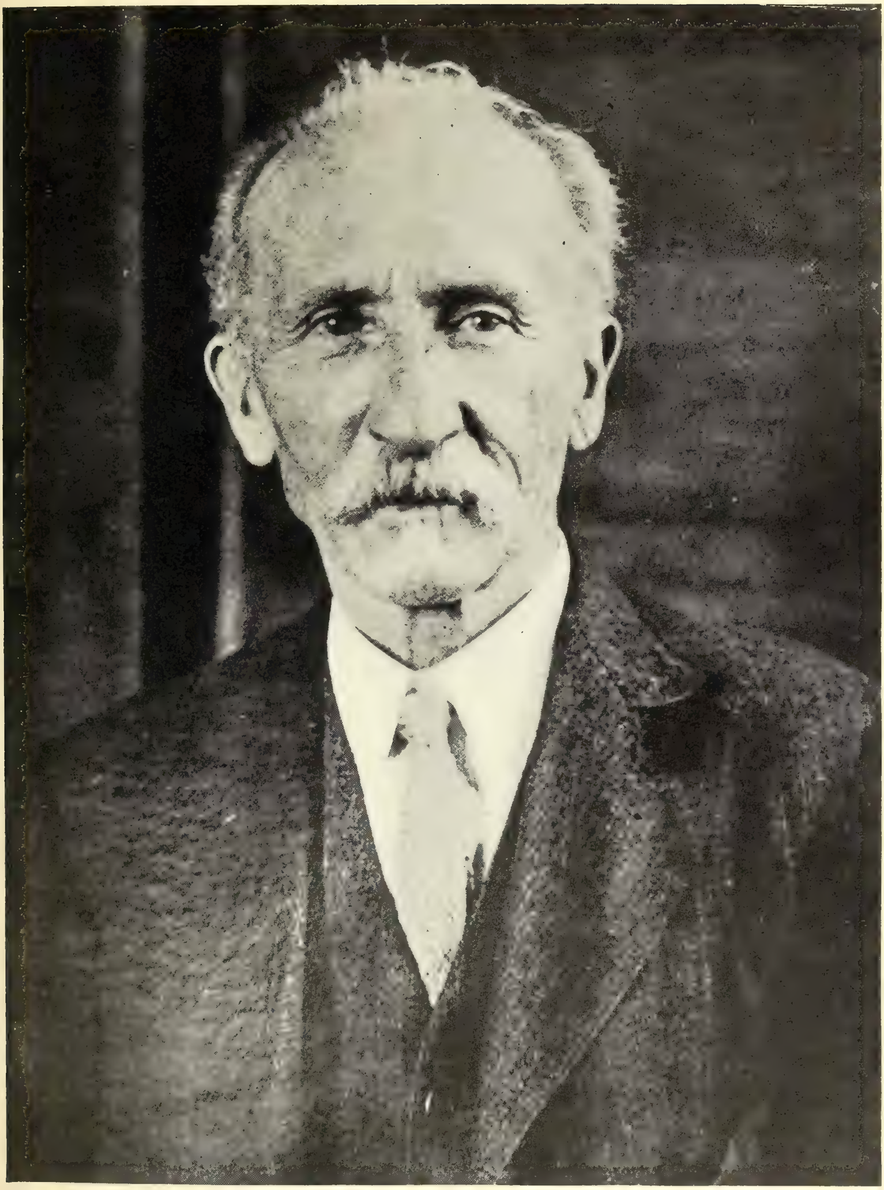
Not of a scientific turn of mind himself, Mr. Doll, nevertheless, has contributed much to our knowledge of entomology. Again and again his name appears in the publications of early writers, applied to species of Lepidoptera, of which he was the discoverer. His chief influence, however, has been among his large circle of friends and acquaintances who have profited by his example as an indefatigable collector, unrivaled in his skill as a preparator. Many of our present-day workers, of acknowledged proficiency, owe their inspiration and initial start to him.

We reprint a brief outline of Mr. Doll's career from the Brooklyn Museum Quarterly of October, 1925.

Chapters from the Long Life of a Butterfly Collector.

The saying, " A naturalist is not made but is born a naturalist," is well exemplified in the person of Jacob Doll, our veteran Curator of Lepidoptera, who at the approaching age of eighty is about to retire from active museum service in order to continue at his own leisure his life-long hobby—the collecting of butterflies and moths.

In this age of specialization the ranks of the old-fashioned naturalists, to which Mr. Doll belongs, are fast thinning out. Like so many of the men of this type, his interest in entomology is not that of the scientific investigator, but rather that of the preparator and collector. From early childhood on, he felt the irresistible impulse to roam afield and to observe nature at first hand. Neglected school work, or, later in life, the meager returns from a



JACOB DOLL.
1847–1929.

vocation, distasteful and indifferently performed—what did they matter compared with the joy of days out of doors and with the gratification of new treasures added to a growing collection. He did not concern himself much with taxonomic details, such as studying the scales on the wings or counting the spines on the legs of an insect, nor did he trouble to record in writing his varied experiences and discoveries. Endowed with a tenacious memory and a keen eyesight, it sufficed his purpose that he could name at a glance any of the thousands of species which had ever come to hand and recall instantly all of the circumstances connected with each acquisition. In this spirit and at the cost of great hardships and privations some of the most notable collections now in Museums have been assembled, but many others, perhaps equally important, have been scattered or destroyed and of the owners and their lives little or nothing is known to-day.

To Mr. Doll's credit there is a long list of moths all bearing the specific name of " dolli " in his honor as the first discoverer of the species. Many of these were collected by him during pioneer days out west. Of his exploits and the incidents connected with the capture of these insects, he is wont to talk freely at times of relaxation among his entomological freinds and it is to be hoped that he may yet be induced to put these narratives in writing. How much more would it mean to students in future generations if with his name they also could associate something of the personality of the collector. For the present only a brief sketch of Mr. Doll's life and activities is available.

Born on May 8, 1847, the son of a baker, in the little town of Edenkoben, Rhine Palatinate, Germany, Mr. Doll recalls most vividly the days of his boyhood rambles over the forest and vine-clad hills of his homeland to which he gave full indulgence, excepting as interfered with by the compulsory attendance at the public school. From these excursions he always returned with something to add to his collections and living pets. A closet in his bedroom was filled with boxes of insects, killed cruelly, but expeditiously, by piercing with the red-hot point of a pin. All through the house there were cages with finches, thrushes, nightingales and other songsters captured by the use of bird lime or by robbing nests. From the woodshed could be heard the cawing of a brood of young crows transferred from their roost in the crumbling tower of the robber knight castle on the precipice overlooking the town. Tethered to the wellsweep, a red fox was tugging and snarling; while in the barnyard with the fowl, a stork with a crippled wing stalked about sedately. As a youngster, Mr. Doll must have been a severe trial to the forebearance of his parents.

At the age of thirteen he was apprenticed to learn the trade of his father. Then followed troublesome years of war and revolution. Austrian, Prussian, and French armies in turn invaded the province and with soldiers constantly billeted in the homes of the inhabitants, the spirit of restlessness became general. A sturdy and well-grown lad at fifteen, young Doll and several of his companions were easily persuaded by a recruiting officer to join the foreign legion of the French army. A gulden or two placed in their hands to bind the bargain, they were started off by rail to report at the garrison in Strassburg, where they arrived in the midst of the celebration of a country fair. With money burning in their pockets, how could they resist such a temptation? Soon they were mingling and jostling in the merry crowd. A friendly soldier from their own town warned them of the dangers and of the horrible life in Algiers, their ultimate destination. So when night came on, their money gone and also their lust for adventure, they sneaked past the sentries, gained the open country and after several days of wandering, reached home again foot-sore and hungry.

A full-fledged journeyman at seventeen and becoming apprehensive of conscription in his unhappy homeland, we next find the young man seeking refuge across the sea, only to be caught in the turmoil of another war when he landed in New York in 1864. After several months of haphazard occupations, he enlisted in the Union Army to serve with the 45th Regiment stationed at Nashville, Tenn. Of the noisy, boisterous lot of men who crowded into the train, only he and a few more recruits were left when they had passed through the tunnel leading to the New Jersey meadows. All the others, mostly substitutes for drafted men, had deserted. Honorably discharged and returned to New York at the conclusion of hostilities in 1865, he moved to Brooklyn, following his trade as a baker or various other callings as long as they afforded a simple living and time to spare for rambles in fields and woods. Very soon he knew all the best places for collecting, not only in the vicinity of Brooklyn, but out on Long Island and in New Jersey as well. This naturally brought him in contact with men of a likewise roving bent—hunters, fishermen and particularly insect collectors, who admired his neatness and skill in the preservation and mounting of specimens. One of the men he met was Max Demuth, a glass blower and somewhat of a taxidermist, who was employed by P. T. Barnum, of museum and circus fame. In 1871, they formed a partnership on an expedition to Florida; Demuth to collect mammals and birds and Doll, insects. At Hogarth Landing on the St. John's River, reached from Jacksonville by rowboat, they built a cabin and lived on fish and game. Demuth, taken sick with fever, sought relief from his aches and pains by drinking whiskey and in his drunken stupor, never saved a skin out of the hundreds of birds and mammals killed. Doll, after nine months in the South, returned with a large collection of butterflies and moths, including a number of species new to science. This led to his acquaintance with some of the more noted entomologists, among them, George Franck, founder of the American Entomological Society, E. L. Graef, William Stadelmeier, Rev. Dr. George Hulst, William Schaup and Berthold Neumoegen, all of whom he survives.

Mr. Neumoegen, a well-to-do banker and the owner of one of the largest collections of Lepidoptera in this country, was so impressed with Mr. Doll's ability as a preparator that he engaged him to take care of his collection, in which service he continued until the death of his employer in 1896. Mr. Neumoegen had a wide circle of correspondents in many parts of the world from whom he received large shipments of specimens, all of which passed through Doll's hands for sorting and mounting. This constant handling of specimens no doubt gave him his remarkable faculty for recognizing species at a glance and for remembering their names. Moreover, he was privileged to retain duplicates for himself, thereby laying the foundation for his own collection, which in time became widely known for the beauty and perfect preservation of the specimens contained therein. In fact, the perfect condition and correct mounting of a butterfly always has been an obsession with Mr. Doll. Torn specimens had no place in his collection. Often, however, they could be saved by mending and patching, a subterfuge in which he acquired such skill as to defy detection. A moth submitted by him to a scientist in Washington proved so puzzling that it was given a new generic as well as specific name. Then, when placed in a moistening jar, its head fell off, disclosing a substitution from another species.

In 1880, Mr. Doll accompanied his employer on a collecting trip to Colorado, where they stopped at various places along the Rio Grande Railroad, whenever collecting conditions seemed favorable. At Almosa, then the railroad terminal, they found a stage waiting to take them to Gunnison. Inside and outside of the coach a number of men were posted, all carrying loaded rifles. When Neumoegen learned that this was a necessary precaution to ward off attacks by the Ute Indians, he decided not to take a chance at losing his scalp and returned home. Doll remained until frost came in October. Mr. Neumoegen, however, was so pleased with the collecting results in Colorado that he sent Mr. Doll on another expedition the following year. This time Mr. Doll traveled to the railroad's end at Tucson, Arizona, and from there by stage to Phoenix and Prescott, where he made the acquaintance of Gus Milow, an ex-soldier who had lived through the Indian campaign and knew everybody, reputable, disreputable, outlaw and Indian. His pride was a spanking pair of horses with which he had twice crossed the continent, driving from Newark, N. J., to Arizona and back again. When he was sober, these horses received his most affectionate attention, but when drunk, which happened whenever there was money to spend, he treated them cruelly. At any rate, Milow became Mr. Doll's guide and carried him safely through wild and inhospitable places. This turned out to be one of the most successful collecting trips ever undertaken.

After Mr. Neumoegen's death in 1896, the late Prof. Franklin W. Hooper, recognizing the importance of the Neumoegen collection, with his usual forethought, brought about its purchase for the Museum by Mr. Frank S. Jones, a member of the Board of Trustees. With its transfer in 1897, the appointment of Mr. Doll as Curator of Lepidoptera also was effected. The acquisition of this collection and its supervision by a custodian so experienced in entomological ways at once established the Brooklyn Museum as a headquarters for students of butterflies and moths. Extensive additions through gifts and by exchanges followed rapidly. The E. L. Graef collection, second in importance only to the Neumoegen collection, was presented to the Museum in 1900. Other valuable gifts received at about the same time were the Stephen Caverly, George Hulst and Charles S. McKnight collections.

To this good beginning Mr. Doll has added largely by field work. Aside from his out-of-door activities on Long Island and near-by localities he has collected in the Adirondacks, the White Mountains and in the North Woods of Maine. He has also been a member of Museum Expeditions sent to southeastern Texas in 1903 and to southwestern Utah in 1904 and 1917; all of which proved very productive. His skill in the preparation of Museum exhibits is shown by the very attractive series of life histories of butterflies and moths common in the vicinity of Brooklyn. The outstanding feature, however, of Mr. Doll's work has been and will always be his conscientious and painstaking attention to the collections entrusted to his care. During the long term of his incumbency there has never been the slightest trouble due to the ravages of dermestes beetles or other Museum pests.

GEO. P. ENGELHARDT,
Brooklyn Museum.

NOTICE.

Change of Address.

On and after June 1st, the editor's address will be 34 De Kalb Avenue, White Plains, N. Y.

J. R. DE LA TORRE-BUENO.

ON PHYLLOPHAGA DEBILIS LECONTE, WITH DESCRIPTIONS OF THREE NEW SPECIES.

By H. C. Fall, Tyngsboro, Mass.

Students of our species of Phyllophaga will recall that LeConte in 1856 in his Synopsis of the Melolonthidae described a small species under the name *Gynnis debilis,* the locality of the unique type being given as Philadelphia. In his Revision of 1887 Horn referred *debilis* as a synonym of *dispar* Burm. (erroneously as it proved), and expressed a serious doubt as to the correctness of LeConte's locality, all specimens known to him coming from Florida.

Some weeks ago I received from Mr. Chas. Liebeck, of Philadelphia, four specimens bearing label Atlantic City, N. J., together with four others from Mobile, Ala., with the request that I compare these with the type of *debilis* and with each other. It was Mr. Liebeck's belief that the New Jersey specimens would prove to be the true *debilis,* and on comparison I did indeed find them to agree with the type in every particular.

Mr. Liebeck writes me that—"These four examples are all that I have now though there must have been more in a pint bottle of specimens picked up in the beach drift at Atlantic City some forty years ago. The alcohol evaporated, the specimens dried and became gradually broken and as there were some *P. gracilis* in the bottle, supposed they were all one species and threw them away."

These Atlantic City specimens, and others taken by Wenzel in Camden and Gloucester Co., N. J. (according to the New Jersey State List) of course abundantly substantiate the correctness of LeConte's original type locality, and it now becomes pertinent to inquire as to the relationship of the New Jersey form to that occurring in the Gulf States. A careful comparison of the New Jersey examples with Mr. Liebeck's Mobile specimens and others in my own collection from Florida and Mississippi inclines me to the belief that though very closely related they are not specifically identical, and I therefore propose the following name for the Southern form.

Phyllophaga austricolia n. sp.

Very similar in size, color, and general appearance to the true *debilis* of LeConte, from which it differs by the perceptibly shorter and more transverse prothorax and notably by the larger head, especially in the male. The ventral sexual characters are nearly the same, but the genitalia differ appreciably, the lobes of the symmetrical claspers which in *debilis* are short and bluntly rounded are here longer and narrowly rounded or subangulate (See fig. 15, pl. XLIX, of Smith's 1888 paper).

The type is a male labelled "Perkinston, Miss. 6–22–22," collected from cypress and sent me by Mr. J. M. Langston.

The three following evidently undescribed species have stood in my collection for many years and I take this opportunity to make them known.

Phyllophaga mariana n. sp.

Rather stout oblong-oval, moderately convex, ferruginous brown, scarcely shining, thinly clothed with short grey decumbent pubescence with intermixed slightly longer erect hairs on the head, thorax, and base of elytra. Clypeus with a moderate obtusely cuspiform emargination, punctures of clypeus and head subequal, not very coarse, separated by from one-half to about their own diameters.

Prothorax not distinctly angulate at sides, margins feebly subcrenulate; surface rather finely and sparsely punctate, the punctures subequal to or slightly finer than those of the head and separated by one to two times their own diameters, not denser laterally. Elytral punctuation slightly coarser and sparser than that of the thorax; sutural costa moderate, the others weak.

Pygidium feebly convex, finely not densely punctate, pubescence short, recumbent; margin rather strongly reflexed at apex. Metasternum with long hair; abdomen with short apressed hairs, first three ventral segments finely closely punctate in apical half, almost smooth in basal half. Length 19 mm.; width 10.2 mm.

Male characters—Antennal club a little longer than the funicle, but distinctly shorter than the entire stem; spurs of hind tibiae and ungual teeth nearly as in *parvidens.* Third ventral segment obtusely tumid at middle along the rear margin; fourth broadly feebly impressed at middle, this area covered with flattened granules and limited anteriorly by an oblique roughened tumidity which extends backward and outward terminating in a smooth acute ridge parallel with the rear margin and about two-fifths the length of the segment therefrom; hind margin obtusely subangularly prominent at middle; fifth ventral with an abrubt ridge along the basal margin in middle third, and a slight median longitudinal impression.

Florida (Lake Mary), a single male specimen.

This species is allied to *rubiginosa, parvidens* and *pygidialis* but differs from all of them, including the var. *hesteropyga* Davis, in the ventral sexual characters. The more flattened pygidium with strongly reflexed elytral margin still further excludes *rubiginosa* and *arvidens,* but should be nearly as in *pygidialis* which I have not seen; the form broader behind, shining surface and punctuation of the latter as described do not at all agree with the present species.

Phyllophaga iroides n. sp.

Subcylindrical, slightly wider behind, dark reddish-brown or rufopiceous, surface distinctly iridescent sericeous and dull.

Head nearly black, somewhat shining; clypeus emarginate, rather strongly and densely punctate, the punctures however not in mutual contact; front less closely punctured.

Prothorax narrowed in front, sides parallel in posterior half, margin finely somewhat irregularly crenulate; punctuation rather fine and evenly distributed, lightly impressed, punctures distant from one to two times their own width.

Elytral punctures but little larger than those of the thorax though more vague; all the costae very feebly indicated. Pygidium broadly convex, sericeous, very finely sparsely shallowly punctate, each puncture bearing a minute hair.

Metasternum finely not closely punctate with short hair; abdomen convex, sericeous, with sparse minute punctures bearing exceedingly fine short hairs; claws with a moderate intramedian tooth.

Length 17 mm.; width 8.75–9 mm.

Male characters.—Antennal club scarcely longer than the basal joint and much shorter than the funicle. Penultimate ventral segment with a small shallow subparabolic concavity which is shining and densely punctate posteriorly.

Described from two males bearing label Huachuca Mts., Arizona, VIII–16–10.

This species possesses the characters of Horn's Group XIII, and because of its iridescent surface is to be associated with *submucida.* In this latter the punctuation is stronger, the elytral costae more distinct, the antennal club of the male very much longer, and the male ventral characters wholly different.

Phyllophaga microdon n. sp.

Oblong, cylindrical, moderately robust, castaneous, shining, above glabrous. Head three-fifths as wide as the thorax, densely punctate throughout; clypeus narrowly reflexed, very feebly to scarcely perceptibly sinuate at middle.

Thorax widest at middle, the sides there strongly rounded, thence subrectilinearly convergent in both directions, the hind angles obtuse, margin feebly flatly crenulated by the short sparse ciliae; surface sparsely finely evenly punctate.

Elytra not very much wider than the thorax (less than one-fifth in the type) and similarly sparsely finely punctate, the punctures separated as a rule by three or four times their own diameters; sutural costa not strong, the others nearly obliterated.

Pygidium shining, nearly flat, with a few very fine scattered punctures. Metasternum finely sparsely punctate and shining, very thinly pubescent. Abdomen shining, almost impunctate except remotely near the sides. Last joint of maxillary palpi fusiform, flattened on the outer face. Claws with a very small basal tooth.

Length 16.5–17 mm.; width 8.3–9 mm.

Male characters.—Antennal club distinctly longer than the funicle but not so long as the entire stem. Ventral segments flattened and a little concave at middle but without other sexual characters except for a small shallow median concavity on the last segment.

Three specimens of this remarkably distinct species are before me, the type in my own collection and two paratypes from Mr. Liebeck's collection. All bear the label "Hackberry Creek, Boquillas Road, Brewster Co., Texas, Sept. 2, 1912, R & H." Mr. Liebeck writes me there are four other examples in the Philadelphia Academy Collection, two of these from the above-named locality, one from Persimmon Gap, Santiago Mts., the other from Dog Cañon, both in Brewster Co. All of the specimens were collected by Rehn and Hebard.

This species must be referred to Group XIII of Horn's Revision where it may precede *glabricula.* It does not at all resemble any of the four species there included; indeed the finely sparsely punctate upper surface, thorax widest at middle with obtuse hind angles, almost glabrous metasternum, tarsal claws with a very small tooth at the extreme base, and the absence of ventral sexual characters aside from the flattening of the segments, form a combination of characters not approached by any other known species of our fauna. The tooth of the tarsal claws is actually as small as in *maculicollis* although this latter is a much smaller species.

The male genitalia of the three species above described have been extracted and prove in every case to be abundantly distinct from any previously figured. The following simple outline sketches of the male claspers while not strictly drawn to scale are sufficiently accurate for comparative purposes. The shorter branch of the terminal fork of the long median process in *mariana* is quite likely a malformation, the organ being otherwise entirely symmetrical. In both *iroides* and *microdon* the claspers are also symmetrical and fused together beneath so that the caudal opening is completely inclosed except for the horizontal notch in *iroides*.

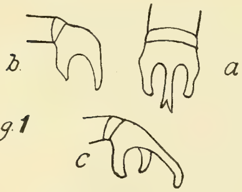


Fig 1

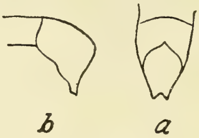


Fig. 2

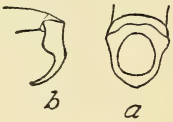


Fig. 3

Fig. 1. *P. mariana* a. caudal; b. lateral; c. caudc-lateral aspect.
Fig. 2. *P. iroides*; same lettering.
Fig. 3. *P. microdon*; same lettering.

EDWIN EDDY CALDER.

Prof. E. E. Calder, Dean of the Rhode Island College of Pharmacy and Allied Sciences, died in Deaconess Hospital, Boston, on January 15, 1929, in his 76th year. Prof. Calder has been an active member of the Brooklyn Entomological Society since 1918. His entomological interests were concerned with the Coleoptera and in this order especially with the Cicindelidae, of which his collection had few rivals in North America. A number of types of species described by him are included.

Prof. Calder was born in Providence, R. I., March 17, 1853, the son of John Lewis and Julia F. Calder. He specialized in the sciences with particular reference to chemistry. He was assistant instructor in analytical chemistry at Brown University from 1874 until 1882, when he became professor of chemistry at the Boston University of Medicine, where he continued until 1906, at the same time being actively associated with the Rhode Island College of Pharmacy. He received the honorary degree of A.M. from Brown University and later the honorary degree of Ph.C. and Ph.D. from the Rhode Island College of Pharmacy and Allied Sciences. In addition to his educational duties he conducted a private analytical chemistry business as a member of the firm of Calder and Strickland in Providence.

On December 23, 1875, Prof. Calder married Ella A. T. Elsbree, who died several years ago. He is survived by one daughter, Frances W. Calder, of Longmeadow, R. I.

Prof. Calder's residence in Providence limited his attendance at the meetings of the Brooklyn Entomological Society to " occasional events," but he was a loyal member, always on the lookout to get support for the publications of the Society.

We are advised that Prof. Calder's collection of Coleoptera and his extensive library are for sale. This would be a valuable acquisition to any institution or collector. We hope both will be acquired by the Park Museum of Providence, R. I., in commemoration of a faithful member and an honored citizen.

George P. Engelhardt,
Brooklyn Museum.

THE INTEGUMENT OF THE LARVA OF THE ALDER FLEA BEETLE.

By William Colcord Woods, Kent School, Kent, Conn.

Summary.

As in insects generally, the body wall of the larva of the alder flea beetle (*Altica bimarginata* Say: Coleoptera, Chrysomelidae) is composed of three layers: (1) a *cuticula,* secreted by (2) an underlying *hypodermis,* which rests upon (3) a structureless *basement membrane.* Three sorts of glands are differentiated in the hypodermal layer: molting fluid glands, glands connected with the trichogens, and " prothoracic glands."

The Cuticula.

The cuticula of the body wall consists of three layers: a very thin faintly staining *epicuticula* (the "*Grenzhäutchen*" of German authors), a deeply pigmented *primary cuticula* which does not stain with an eosin-haematoxylin combination, and a non-pigmented *secondary cuticula* which does stain. This staining reaction has probably little significance: i.e., in another chrysomelid larva (*Deloyala clavata* Fabr.) under similar conditions the primary cuticula stains violet, and the secondary pinkish.

The cuticula is covered with conspicuous nodules which lie thickly scattered between the setiferous tubercles; their appearance in a caustic potash preparation is shown in figure 1 and in cross section in figure 2. Together with the tubercles these nodules are by far the most deeply pigmented portions of the cuticula, although pigment granules occur in other parts. The nodule, most of which is primary cuticula, is covered by a comparatively thick cap of epicuticula which is very deeply pigmented.

The writer has made no chemical tests and does not know the extent of chitinization in the cuticula. The primary layer is probably the only sclerotized portion: (1) the cuticula of a newly molted larva is devoid of pigment; sclerotization after ecdysis is correlated with pigmentation, and with the exception noted above, pigment is restricted to the primary cuticula; (2) the secondary cuticula increases in thickness during the instar, whereas sclerotization is complete two or three hours subsequent to the molt.

Even the primary cuticula must be somewhat elastic since the integument stretches considerably during the instar; the cuticula nodules lie much closer together just after the molt than they do a few days later. This is a generalization true of this type of chrysomelid larvae. In all those studied, the internodular cuticula is sufficiently transparent to allow the fat body to show through so as to determine the general body color of the larva; in most species, it is yellow or orange as in *bimarginata,* but in *A. corni* Woods, for example, it is white. In each species the color of the eggs and of the pupae is correlated with that of the fat body, which is constant in color throughout all the stages.

The body wall is of course continuous with the lining of the fore-intestine, the hind-intestine, the spiracular invaginations and those of the salivary glands. Primary and secondary intima may be traced in the fore- and hind-intestines, and at the very beginning of the spiracular invaginations. The writer cannot detect any such differentiation in the tracheae or in the salivary glands (even at the point of invagination), and there is apparently no "epi-intima" developed anywhere, the epicuticula ceasing at the point of invagination.

THE HYPODERMIS.

The hypodermis consists of cuboidal or rectangular cells, somewhat variable in size and shape, which present as such no special modifications in the larva, Late in the prepupal period, the cells become greatly attenuated, a condition quite different from the typical columnar epithelium of the larva and one which persists through most of the pupal instar. Except in the region of the imaginal discs, the hypodermis is but a single layer of cells in thickness.

THE BASEMENT MEMBRANE.

The basement membrane is a delicate structureless limiting membrane developed at the base of the hypodermal cells. In well fixed material, its presence is always clear, but the writer has never detected any trace of nuclei in it.

THE MOLTING FLUID GLANDS

The molting fluid glands are the most conspicuous of the hypodermal glands. They are large unicellular glands, occurring in all parts of the body apparently without regular arrangement, not infrequent in sections, but not developed in great numbers. The writer prefers to treat them as unicellular glands, although strictly each gland consists of three cells, two small cells which serve as neck or guard cells, and a much larger secreting cell.

In larvae sectioned immediately after ecdysis, the glands are not charged with secretion vacuoles, and the canaliculi through which the gland empties may be seen plainly. (The writer has no data as to whether or not these canaliculi are chitinized.) The course of this canal is quite variable. It is always somewhat convoluted, and apparently is always two branched, the forking occurring usually close to the cuticula as in figure 4, but sometimes farther back as in figure 3. (As the portions of the canal lie at different levels, these figures are necessarily reconstructions from several successive serial sections.)

Both figure 3 and figure 4 are drawn from a larva fixed during ecdysis. The molting fluid is elaborated during the instar and the gland gradually becomes charged with secretion vacuoles. During this process the glands become somewhat but not very greatly enlarged. An enlarged and vacuolar gland, drawn from a two day prepupa, is shown in figure 5. Typically the discharge of the molting fluid takes place on this day, for sections of three day prepupae usually show the glands somewhat reduced in size and without secretion vacuoles, a very faint trace of the forming pupal cuticula, and a coagulum between the hypodermis and the now separated larval cuticula.

Since well formed molting fluid glands are to be found in sections of larvae fixed at eclosion or just after ecdysis, and since there is no appearance of "incipient" glands in a larva just ready to molt, the writer believes that each gland is persistent from embryonic life up to the pupal stadium, and functions several times. (The cells do increase in actual size, but the increase is proportional with those of the hypodermis and epithelium.) These glands persist through the prepupal period (after their functioning on the second day) in a sort of resting condition, and the writer has found them in sections of pupae up to the fifth day of pupal life. He is unable to state definitely when and how they disappear.

That the molting fluid complex is entirely surrounded by the basement membrane is always clear in well fixed material. The writer has already suggested his interpretation of the three cells of this complex. The two upper cells, much smaller than the lower, are protecting neck cells. Frequently if not typically the nucleus of one cells is decidedly smaller than that of the other.

The cell divisions, always difficult to make out, were in no case examined so sharply defined as in the figures. In some series only one of the neck cell nuclei is apparent (as in figure 4), but the writer does not consider this a normal condition even though careful search has failed to reveal the missing nucleus. The lowermost cell is the secreting cell, but the canaliculi go without break through the neck cells.

The writer does not believe that the canaliculi ever open by a cuticular pore to the outside, as has been figured for certain species. He has found no evidence of such a pore, and apparently the molting fluid is poured out when the new cuticula is just forming, before it has covered over the hypodermis at the base of the gland. Were the canaliculi to penetrate through special pores, it is evident that new glands would have to be formed at each ecdysis, which is almost certainly not the case.

In caustic potash preparations, what seems to be cuticular pores appear rarely in the setiferous tubercles. These pores are really trichopores, and usually a tiny seta may be found connected with them. In figure 1, such a trichopore with a tiny seta is shown on the left of the tubercle, and on the right is a trichopore where the seta has entirely failed to develop. These pores have nothing to do with the molting fluid; they are vestiges which indicate (as comparative studies make abundantly clear) that the evolution of the setal pattern in *Altica* has been a process of reduction.

As one would naturally expect, the molting fluid glands of *Altica* are almost exactly similar to those of *Galerucella*, which Poyarkoff (1910, p. 31–40, fig. 12) has described as the "glandes à trois noyaux" of the larva, save that in the elm leaf beetle the neck is somewhat more drawn out, and the cell divisions are even less apparent than in *Altica*.

The Trichogen Cells.

The setae of the larvae are hollow and each one is connected with two cells, the seta forming, or trichogen cell proper, and an associated gland cell. The hair is slightly enlarged at the tip, where there is a pore to permit the exit of the secretion of the gland (see figure 1). The secretion is odorless and is not put forth in droplets when the larva is disturbed. It certainly is not of a repugnatorial nature. Since the integument sheds water easily, and since minute particles easily adhere to the more or less sticky skin, the secretion is perhaps of a waxy nature. The writer interprets the setae as primarily sense hairs, with which a glandular secretion (perhaps, as the larvae feed exposed on the upper surface of the leaf, concerned with making the integument waterproof, so as to shed rain and to check evaporation) is secondarily and incidentally associated.

In a larva fixed and sectioned immediately after a molt, the gland cell extends some little distance up into the seta (see figure 6) but glandular activity is indicated by the appearance of a lumen which becomes progressively larger during the instar. This condition is shown in figure 7, from a full fed larva. A very thin protoplasmic film which encloses the secretion droplet, running about half way up the seta, is not shown in the figure.

Trichogen cells may be found in larvae sectioned immediately after their hatching, and the same trichogen cells function throughout larval life, merely showing, as do the molting fluid glands also, an increase in size proportional to that of the other cells. The trichogen cells of the pupa are of a very different type, and are similar to those figured by Poyarkoff (1910, fig. 10) for *Galerucella.* What the writer interprets as the trichogen cell proper is a large elongate cell extending up into the seta, and the gland cell beside it is relatively small (the "cellule compagne" of Poyarkoff). The writer believes that during the prepupal period most of the larval trichogens are destroyed, and that the others are converted into trichogens of the pupal type. Not only the pupal setae fewer in number but they are of a very different type. They are solid, not hollow, and have no glandular function; they support the pupa from contact with the pupal cell and are therefore practically confined to the back, as the pupa always lies with the ventral aspect uppermost. They are probably not even sense hairs; at least, the writer has never detected any innervation.

In some sections of larvae the nervous connection is apparent, and it is shown in both trichogens figured. Two or three of the nerve nuclei of the complex are always larger than the others, and these large cells are confined to the region just below the trichogen. As indicated in the figures, the trichogen and gland cells are always sharply distinct from the nerve tissue. The writer has no material properly stained to study the detailed innervation. In nearly all cases, as in figure 6, one can detect only the nuclei, but one section shows clearly the joining of several of these nuclei as illustrated in figure 7. The nerve nuclei resemble the "Sinneszellgruppe" of Korschelt (1924, p. 218) and are likewise divisible into larger nuclei (Sinneszellkerne) near the seta and smaller nuclei (Neurilemmkerne) which may occur anywhere along the nerve. The writer does however hesitate to call the smaller nuclei in *Altica* "neurilemma nuclei" since in all his sections the neurilemma seems to be a very thin structureless membrane devoid of nuclei, and, as shown in figures 6 and 7, is in all cases plainly continuous with the basement membrane of the hypodermis which is certainly non-nucleated. (The basement membrane is also apparently continuous with the sarcolemmata of the muscles as they attach to the cuticula through the hypodermal tendons.) As shown by figure 7, the trichogen nerve arises from the subhypodermal plexus, but the writer has not been able to trace the nerve in his sections much farther than is designated in the figure.

Aside from the innervation which is not discussed in the papers referred to below, conditions are very similar to the poison setae of *Hemerocampa, Apatela* and *Euchaetias* figured by Gilmer (1925, p. 210); there is however no tendency for the trichogen cell proper to degenerate as in *Euchaetias,* and the hairs are not crowded together in tufts as in lepidopterous larvae. The setae also resemble those figured by Matheson (1923, p. 55) as type IV of *Pseudococcus,* except that in *Altica* the trichogen complex is made up of two cells instead of three. Most of all naturally they resemble the trichogen cells of *Galerucella* (Poyarkoff 1910, p. 27–31, fig. 8). Poyarkoff figures two nuclei in his drawing of the trichogen complex, but he does not distinguish between the gland cell and the trichogen proper in his text.

THE PROTHORACIC GLANDS.

The head of the *Altica* larva is somewhat retracted under the prothoracic shield, with which it is connected by a non-sclerotized fold of the cuticula. The hypodermis of this membranous fold is very glandular, and probably secretes a lubricating fluid. These glandular cells are several times as large as the ordinary cells, and show secretion vacuoles.

The cells were noted by Poyarkoff (1910, p. 33) in *Galerucella* larvae, and called by him "les glandes prothoraciques." In that species, each gland is remarkable in possessing from five to twelve separate canaliculi. One would expect to find a similar condition in *Altica,* but the writer has not been able to detect such canaliculi in his sections.

THE RECTAL GLANDS.

The writer has already described (Woods, 1918, p. 305) unicellular glands in the rectal epithelium of this larva, which are interpreted as the molting fluid glands of the hind intestine. In structure and staining reactions they are entirely unlike the molting fluid glands of the hypodermis. These glands may occur in the otherwise unmodified hypodermis at some little distance from the point of the rectal invagination.

The glands are of course totally unlike the so-called rectal glands of certain insects, which are more properly termed "pygidial glands."

THE EVERSIBLE GLANDS.

Segmentally arranged eversible glands such as were described in detail by Garb (1915) for *Melasoma lapponica* are totally wanting in *Altica,* and so far as the writer knows in all alticine and galerucine larvae. They are probably confined to and characteristic of the tribes Phaedonini and Phyllodectini of the subfamily Chrysomelini. The writer has found these eversible glands in all larvae of these two tribes which he has been able to examine: *Plagiodera versicolor* Laich., *Gastroidea polygoni* L., *Lina interrupta* Fab., *Lina scripta* Fab. and *Phyllodecta americana* Schaef. He has sectioned larvae of only the last named species but in it conditions are exactly similar to those described so clearly and carefully by Garb.

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EXPLANATION OF FIGURES. PLATE XIX.

Figure 1. Caustic potash preparation of integument, showing seta with pore, setiferous tubercle with very small trichopore and seta (left) and very small trichopore without seta (right); a few of the cuticular nodules are shown above the tubercle.

Figure 2. Section of the integument, showing the nodules in cross section. E is epicuticula; P is primary cuticula; S is secondary cuticula; H is hypodermis; BM is basement membrane.

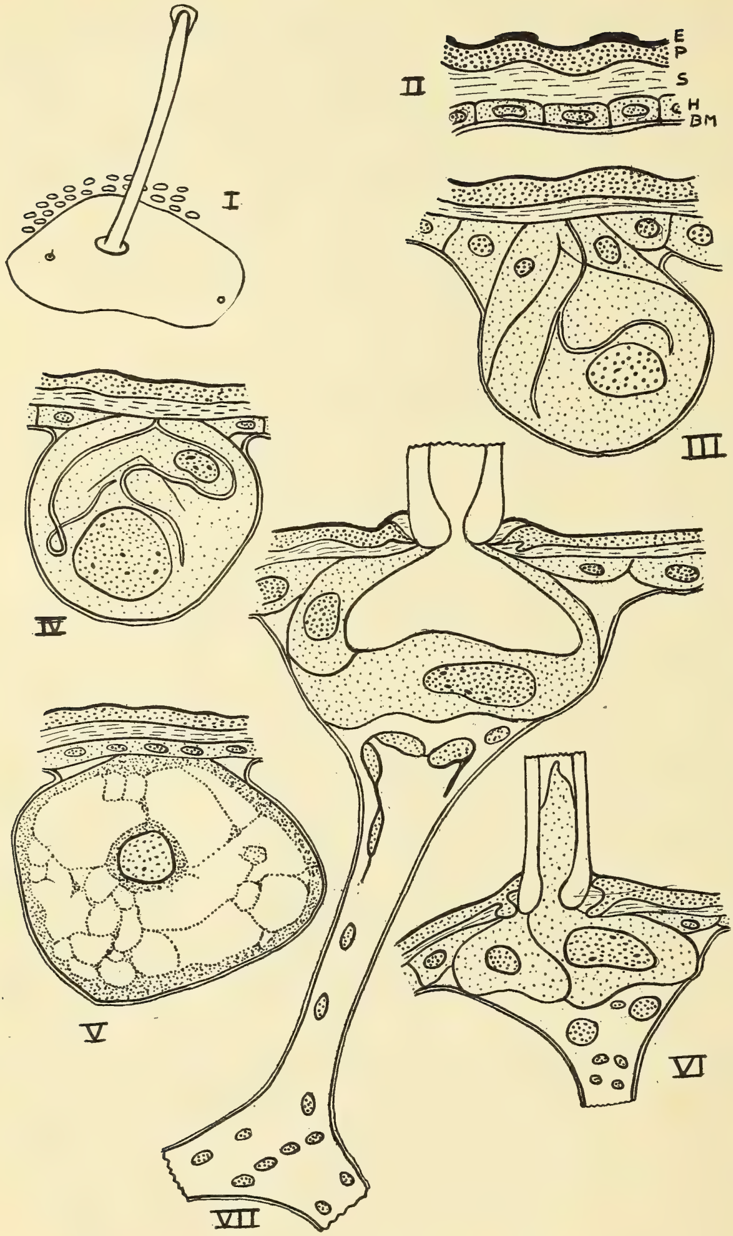
Figure 3. Molting fluid gland, from larva fixed during the molt to the third instar, showing the two neck cells and the canaliculi; the forking is not usually so far back in the cell.

Figure 4. Molting fluid gland, from larva fixed during the molt to the third instar, showing typical arrangement of canaliculi. This particular gland showed only one neck cell nucleus.

Figure 5. Molting fluid gland, charged with secretion vacuoles, from two day prepupa. The neck cells do not show up as distinctly in this section, but are nevertheless present.

Figure 6. Trichogen complex showing innervation and extent of gland cell from larva fixed during the molt to the third instar.

Figure 7. Trichogen complex showing detailed innervation and secretion vacuole developed late in the third instar.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Vol. XXIV JUNE, 1929 No. 3

BULLETIN

OF THE

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BULLETIN

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BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXIV June, 1929 No. 3

NEW SPECIES OF MELOIDAE (COLEOPTERA).

By Edwin C. Van Dyke, University of California, Berkeley, California.

Tetraonyx albipilosa n. sp.

> Of the size, form and general appearance of a small *Tetraonyx fulva* Lec.; ochre colored, the antennae, apices of the femora and tibiae, tarsi and underside of the body black; densely clothed above with fine, erect, white pile. Head distinctly triangular, front finely and sparsely punctured, eyes prominent, antennae extending slightly behind hind margins of prothorax. Prothorax three-fifths as long as broad, finely and rather sparsely punctured, transversely impressed in front of scutellum, hind angles somewhat obtuse and blunt at apex. Elytra two-sevenths longer than broad, broadest behind middle, finely, rather closely and distinctly punctured. Length 9 mm. (from vertex of head to apices of elytra), breadth 4.5 mm.

Holotype (No. 2599, Mus. Calif. Acad. Sci.), a unique in the museum of the California Academy of Sciences, collected by Mr. J. O. Martin at Pecos, Tex., May 15, 1927.

This species which rather closely resembles *fulva* Lec. may always be distinguished by its ochre color and white pile, *fulva* Lec. and *femoralis* Dugés being orange colored and with orange pile. *Tetraonyx frontalis* Chevr. and *femoralis* Dugés also differ by having black faces and very dense punctuation and *frontalis* in addition by having entirely black legs. No described Mexican species could be confused with it.

Epicauta foxi n. sp.

> Rather small and short, black with exception of small linear orange patch on front of head, disk of pronotum and elytra

rather sparsely furnished with very short and inconspicuous black hair, sides of head, sides, basal margin and triangular area at apex of prothorax, suture, lateral and apical margin of elytra, entire underside and basal three-fourths of femora clothed with rather long and conspicuous cinereous pile. Head quadrate, rather coarsely and sparsely punctured on front, more finely and closely near the eyes, somewhat shining, median longitudinal impression notched at vertex, finely impressed on front and triangularly impressed in front; eyes not prominent, long and narrow and with head deeply impressed along posterior margin; antennae rather short, extending backwards three segments beyond hind margin of prothorax, segments closely articulated and but slightly narrowed apically. Prothorax somewhat quadrate, broader than long, sides straight and parallel behind, broadly rounded in front, disk somewhat flattened, rather finely and closely punctured, very finely and closely so in triangular area in front, median longitudinal impression quite deep at center, vague impressions at sides. Elytra over twice as long as broad, surface finely granulate, the punctuation fine, hardly observable between the granules. Beneath rather finely and closely punctured. Length 10 mm., breadth 3 mm.

Holotype (No. 2600, Mus. Calif. Acad. Sci.) and three paratypes in the museum of the California Academy of Sciences, collected at Jacumba, San Diego Co., Calif., Oct. 3, 1295, by Mr. J. D. Gunder and presented to the Academy by the late C. L. Fox, after whom I take great pleasure in naming it.

The species like *impressifrons* Van Dyke, previously described in this journal, belongs in that peculiar and small group of *Epicauta* which includes besides these two, *caviceps* Horn, *rileyi* Horn and *straba* Horn, all characterized by being rather short and with the antennae scarcely more slender to tip, the segments cylindrical, the eyes narrow, emarginate in front, not over prominent and the vertex always definitely sulcate or at least notched. In color pattern, it resembles *alphonsii* Horn but the latter has the antennae more narrowed apically, the eyes broad, and the prothorax longer than wide and but sparsely punctured, placing it in a different group.

The following key will enable the members of the *caviceps* group to be separated.

1. Upper surface densely clothed with cinereous or slightly ochraceous colored pile..............................2
Upper surface black or with but the margins cinereous......4
2. Vertex and front of head deeply sulcate, the pronotum impressed near hind angles, suture of elytra somewhat elevated in front of middle. S. Ariz................*caviceps* Horn
Vertex only notched, the front but finely grooved at most..3
3. Pronotum evidently impressed on either side, elytral suture distinctly elevated at middle. S. Ariz.........*rileyi* Horn
Pronotum evenly convex, elytral suture normally straight. Palm Springs, Calif.............*impressifrons* Van Dyke
4. Entirely black, vertex notched, pronotum shallowly canaliculate but with large and rather deep impressions on either side. S. Calif...........................*straba* Horn
Black with cinereous hair margining prothorax and elytra as well as clothing the underside, vertex notched, pronotum with well marked longitudinal impression at middle and with but vague impressions at sides. Jacumba, Calif..**foxi** n. sp.

Lytta nigrocyanea n. sp.

Of large or moderate size, quite robust, subopaque, a deep indigo blue color, the antennae black, the legs bluish black, and a small spot on the front orange; head, prothorax and basal margin of elytra clothed with erect black hair. Head quadrate, rather coarsely punctured on the front, more finely and closely on the vertex and posterior angles, the vertex faintly notched at center; eyes slightly emarginate anteriorly; antennae extending several segments beyond base of prothorax, intermediate segments markedly unilaterally clubbed in males, less so in females, the seventh and eighth segments the largest in males. Prothorax broader than long and generally broader than head, broadest in front of middle, sides arcuate; disk slightly convex or flattened, with median longitudinal line well impressed at middle and at base, often with shallow lateral impressions, and moderately punctured at center and finely, closely punctured at sides. Elytra considerably broader than prothorax, two and a half times as long as broad, the surface deeply, more or less confluently punctate and cribrate, more finely so at sides. Beneath finely and moderately closely punctate, anteriorly clothed with fine, erect black pile. Outer spur of hind tibiae broad and concave, inner of equal length but spiniform. Length 15–20 mm., breadth 4–6.5 mm., average length 16 mm. and breadth 5 mm.

Males with pygidium broadly rounded at apex, fifth ventral triangularly emarginate at apex, front tibia with but one very long and curved spine at apex, and hind trochanters with an acute spine. The antennae are longer and the intermediate segments slightly more enlarged than in the female.

Holotype male (No. 1601, Mus. Calif. Acad. Sci.) and several designated paratypes from a series of seven specimens collected at Palisade, Colo., May 7, 1901, and submitted to me by the Colorado Agricultural College at Fort Collins, Colo. Through the kindness of Dr. Gillette, the Holotype and one paratype will be deposited in the museum of the California Academy of Sciences. The remainder will be found in the collection of the Colorado Agricultural College.

This species according to Fall's key[1] would run close to *nuttalli* Say and *cyanipennis* Lec., which it resembles in general size and appearance, but differs in color, being of a uniform deep indigo blue, has the elytra much more evidently sculptured, and the front tibiae of the males with but one spine at apex whereas in the others there are two.

Lytta maculicollis n. sp.

Large and more or less cylindrical, somewhat shining; black, apical area of prothorax reddish orange, the markings generally in the shape of an inverted U, and an orange spot on the front of the head; quite glabrous above. Head well rounded in outline, rather finely, not closely punctured, the vertex faintly notched; eyes slightly emarginate in front; antennae robust, distinctly moniliform, extending three segments beyond base of prothorax, segments gradually narrower outwardly. Prothorax slightly longer than broad, narrower than head, the sides straight and somewhat convergent posteriorly, well rounded apically, disk barely convex, with median longitudinal line vaguely impressed if at all, and finely, irregularly and sparsely punctured. Elytra considerably broader than head, about two and a half times as broad, the surface finely reticulate. Beneath finely, moderately closely punctured in front, more sparsely on abdomen and clothed with fine pubescence in front. Outer spur of hind tibia stout, cylindrical, obliquely truncate at apex, the inner shorter and spinous. Length 14–22 mm., breadth 4–7 mm., average length 18 mm. and breadth 6 mm.

Males with pygidium truncate at apex, fifth ventral deeply triangularly emarginate at apex, front tibia with the usual

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[1] Tr. Am. Entom. Soc., Vol. XXVII (1901), pp. 295–300.

> pair of rather short spines at apex, and hind trochanters elliptical and without spines. The antennae of the males are longer than those of the female, with the segments 4–10 elongate elliptical, whereas they are shorter and more triangular in the females.

Holotype male, allotype female (Nos. 2602 and 2603, Mus. Calif. Acad. Sci.) and several designated paratypes in my collection from a series of thirty-eight specimens taken by myself from lupine near Panoche Creek in western Fresno Co., Calif., April 29, 1922. A paratype will be deposited in the U. S. National Museum at Washington.

This species, I had confused for some time with *Lytta molesta* Horn, a species to which it is rather closely related and which superficially resembles it and which moreover is to be found in its territory. *Lytta molesta* Horn is generally broader and more robust; with the head more quadrate; the prothorax much broader, flatter, subangulate at sides, the orange markings lateral; and the males with the hind trochanters definitely spined. The orange markings of *maculicollis* are quite variable. In a few specimens the apical two-thirds of the prothorax is orange, in most an inverted U-shaped spot is to be found, in others there are only lateral spots while in a few specimens, the prothorax is entirely black. These last might be confused with *Lytta insperata* Horn which they simulate but the spined hind trochanters of the males of the latter will separate them. *Lytta hoppingi* Wellm., another species of the same general territory, with bicolored prothorax, is narrower, with the prothorax more cylindrical and the orange spots of the same always lateral, as well as with the entire upper surface sparsely pilose.

Lytta auriculata Horn

This species is represented in the arid parts of the western San Joaquin Valley by a phase which is entirely unicolorous, also somewhat more of a bottle green than the more typical southern specimens.

Lytta lecontei Heyden

This name should replace that of *Lytta dichroa* (Lec.). LeConte named his species in 1853, but Fischer used the same name in 1823 for a species from southern Russia. Heyden in 1890 detected the duplication and suggested the name *lecontei* for LeConte's species.

Colospasta elegans (Lec.) and *Colospasta perpulchra* Horn

Upon critically examining my series of these two so-called species, I find that each not only varies considerably as to color but also as to sculpture and that they grade into each other in intermediate territory. Typical specimens of *perpulchra* as stated by Horn[2] have the head and prothorax quite smooth but others found with typical specimens have the same parts as evidently punctured as they normally are in *elegans*. There being no other good characters to separate them, I would in consequence class them as but one species. In the hills bordering the southwestern part of the San Joaquin Valley, there occurs an entirely blue phase. This, I would call the subspecies **cyanea** and designate as the Holotype (No. 2604, Mus. Calif. Acad. Sci.), a specimen collected on Mt. Pinos, eastern Kern Co., Calif., June 18, 1904, by Mr. Fordyce Grinnell. The head and prothorax in the three specimens which I possess are quite smooth as in *perpulchra*. I would indicate the various named phases of *elegans* as follows:

Colospasta elegans (Lec.)
  var. *humeralis* Horn
  subsp. *perpulchra* Horn
  subsp. **cyanea** n. subsp.

Zonitis arizonica n. sp.

Narrow and elongate, subopaque, finely pubescent; testaceous, eyes, apices of mandibles, terminal segments of palpi, apices of femora and tibiae, greater portion of tarsi and abdomen black or piceous. Head triangular, tempora prominent, front rather coarsely, closely punctured; eyes large and convex, slightly emarginate in front, separated anteriorly by a distance equal to their width, beneath by only the narrow gula; antennae slender and long, two thirds the length of the body, segment two three fourths length of three, fourth but one fourth longer than three and subequal to fifth, sixth slightly longer and narrower, the following gradually shorter. Prothorax about as long as broad, flattened on disk subcampanulate, broadest at base, sides sinuate just in front, thence almost parallel to beyond middle and oblique and slightly rounded to apex, densely rather coarsely punctured, with median longitudinal line vaguely impressed. Scutellum densely, finely punctured. Elytra about three times as long as broad, very densely, rather coarsely and more or less confluently punctured. Beneath slightly more shining, rather closely and finely punctured. Hind tibial spurs short, stout, concave and subequal. Length 11 mm., breadth 3.25 mm.

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[2] Notes on Coleoptera by George H. Horn, Proc. Am. Phil. Soc., Vol. XXIX (1891), pp. 99–102.

Male with fifth ventral impressed at apex, the sixth deeply triangularly emarginate.

Holotype (No. 2605, Mus. Calif. Acad. Sci.) and one parotype in the museum of the California Academy of Sciences, the first from six miles south of Florence, Ariz., July 23, 1924, the second from near Tucson, Ariz., Aug. 11, 1924, both collected by Mr. E. P. Van Duzee.

This species is in color, size and physical characters probably quite close to *Zonitis megalops*[3] Champ. from Guatemala, but it differs in several ways. In the latter, there is a vague median vitta on the prothorax and scutellum, the antennae are somewhat annulated, and the femora are barred at the middle; in the antennae the second and third segments are subequal, fourth nearly twice the length of the third and the fourth to the sixth subequal; the prothorax longer than broad and finely punctured; and the elytra very densely and finely punctured. From the lighter phases of the two large eyed species of our own country which belong in the same group with it, it can be readily separated, *vittipennis* Horn having the prothorax and elytra very sparsely punctured and *longicornis* Horn, the elytra proportionally shorter and broader as well as much more finely punctured and the intermediate antennal segments shorter. Typical specimens of the two last can of course always be separated by their vittate markings.

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[3] Biol. Centr.-Amer., Coleopt., vol. IV, pt. 2 (Feb., 1892), pp. 386–387.

THE GENUS ANTEOS HUBNER (LEPIDOPTERA, PIERIDAE).

Generic Status and Relationships, and Male Genitalia, with a Description of a New Structure in the Rhodocerini.

By Alex. B. Klots, Ithaca, N. Y.

As pointed out by Godman and Salvin (1) the New World species generally placed in the Old World genus *Gonepteryx* Leach are worthy of generic distinction. To these the generic name *Anteos* Hübner applies (2). Röber (3) along with other authors has advocated placing these species under *Amynthia* Swainson (4), but this name is of later date than *Anteos* and therefore a synonym. In spite of his own suggestion Röber places them in *Gonepteryx*.

Three very distinct species are known, *maerula* Fabricius, *clorinde* Godart and *menippe* Hübner. *Maerula* is the type of the genus, having been so designated by Godman and Salvin (1).

Menippe was tentatively placed in *Catopsilia* by Forbes (5) on the basis of the rounded secondaries and the rudimentary hair-pencil on the primaries. Although *menippe* does indeed differ from *maerula* and *clorinde* in various characters in which it more or less resembles *Catopsilia*, these characters seem insignificant compared with its striking similarity to *maerula* and *clorinde* in the male genitalia.

In making any comparison with *Catopsilia*, however, we must first define *Catopsilia*, inasmuch as structurally the Old World species of *Catopsilia* are exceedingly distinct from the New World species. This difference is so marked that the writer proposes to treat of it in a later paper. For the present purposes of comparison the Old World and the New World *Catopsilia* have been treated as distinct groups, with *C. florella* as representative of the Old World group and *C. statira* and *rurina* for the New World.

Description of Terms Used.

Male genitalia.

Basal Prong of Uncus. (See Figs. 9 and 10.)—A small lobe located dorsally near base of uncus. Note that the presence of this structure is correlated with the presence of the basal prong of the penis.

Harpe and its Lobes.—In *A. menippe* (Fig. 9) only one dorsal lobe is present, but in *A. maerula* and *clorinde* (Figs. 11 and 12) and in Old World *Catopsilia* (Fig. 10) two are present. The more basal I have designated "dorsal lobe *a*." Dorsal lobe *a* is evidently a thickened portion of the infolded edge of the harpe, and bears strong setae distally. Dorsal lobe *b* is in *Anteos* and Old World *Catopsilia* a more or less trough shaped structure, heavily chitinized along its distal edge. In *Gonepteryx* (Fig. 2) it is merely a pointed heavily chitinized lobe, while in New World *Catopsilia* it shows high development (Figs. 1 and 4).

The distal process is comparatively simple in all the groups except New World *Catopsilia* where it often shows some evidence of bifurcation and bears heavily chitinized teeth (Fig. 1).

Ventral lobe *a* arises, as does dorsal lobe *a,* from the infolding of the edge of the harpe, is rounded and bears strong setae. It is absent in the New World *Catopsilia* (except *statira* where it is exceedingly weak) and in *Gonepteryx.* It is small, fairly heavily chitinized, and probably arises from the distal process as was postulated by the writer for an homologous lobe in New World *Eurema* (6).

Penis. The basal prong of the penis appears to be present always when the basal prong of the uncus is present. The variously heavily chitinized teeth on the penis are relatively constant in presence and position. In *Anteos* they furnish characters for differentiation of the species. (See Figs. 9, 11, 12.)

THE RAISED LINE (See Figs. 3, 5–8).

This curious structure, if I may call it a structure, has not, as far as can be determined, hitherto been noticed or used in classification. It consists of a narrow line on the primaries above, formed by a double or triple row of scales which are raised up more or less on end. Needless to say it is rather hard to see and does not show on rubbed specimens nor on those in which the wings have been pressed down hard by glass on the mounting board. It is best seen by examining the wing with a strong light striking it at a very acute angle.

I should hesitate to make use of so minute and evanescent a character were it not for the fact that examination of a large series of specimens has shown it to be constant in position and to correlate well with structural characters of undoubted value. It has been noted on species of all the groups of *Eurymus* (*Colias*) and *Meganostoma*, on *Teriocolias, Dercas* and *Eurema,* on *Gonepteryx, Anteos, Nathalis, Kricogonia,* and on both New and Old World *Catopsilia.* In all of these its position is definite. In some cases specific differences are shown, in other cases generic differences. The structure seems to be limited to the *Rhodocerini.*

The origin of the raised line is hard to state, especially at this early date. A guess, which may prove to be correct, is that it is caused by the silk band or thread around the pupa.

The line is most easily seen in *Gonepteryx* where it appears to point out a specific difference between *rhamni* and *cleopatra.*

COMPARISON OF ANTEOS WITH CATOPSILIA AND GONEPTERYX.

As the data do not readily lend themselves to a tabular arrangement the groups under consideration are compared structure by structure as follows:

Apex of Primary:
- *Anteos*—
  - a. *menippe*—rounded, slightly falcate.
  - b. *maerula* and *clorinde*—bluntly pointed, strongly falcate.
- *Old World Catopsilia*—rounded, not falcate or very slightly so.
- *New World Catopsilia*—
  - a. *avellanada*—rounded, slightly falcate.
  - b. other species—rounded, not falcate.
- *Gonepteryx*—acute, slightly to strongly falcate.

Outer Margin of Secondary:
- *Anteos*—
  - a. *menippe*—rounded, slightly scalloped between veins.
  - b. *maerula* and *clorinde*—acutely tailed at M_3 (cf. *Gonepteryx*).
- *Old World Catopsilia*—rounded, slightly scalloped between veins.
- *New World Catopsilia*—
  - a. majority of species—rounded, slightly scalloped between veins.
  - b. *neocipris*—a rounded tail at 2d A.
- *Gonepteryx*—acutely tailed at Cu_1.

Venation of Primary:
- *Anteos*—
  - a. *menippe*—M_1 stalked on $R_3 + R_{4+5}$ very slightly more than half way out from cell to base of R_{4+5}; distance from

base of R_2 to end of cell very slightly greater than length of middle discocellular.

b. *maerula* and *clorinde*—M_1 stalked on $R_3 + R_{4+5}$ considerably more than half way out from cell to base of R_{4+5}; distance from R_2 to end of cell very slightly less than length of middle discocellular.

Old World Catopsilia—M_1 stalked on $R_3 + R_{4+5}$ about half way out from cell to base of R_{4+5}; distance from R_2 to end of cell less than length of middle discocellular.

New World Catopsilia—M_1 stalked on $R_3 + R_{4+5}$ from 1/3 to 1/2 way out from cell to base of R_{4+5}; distance from R_2 to end of cell averaging equal to length of middle discocellular.

Gonepteryx—M_1 stalked on $R_3 + R_{4+5}$ from 1/3 to slightly less than 1/2 way out from cell to base of R_{4+5}; distance from R_2 to end of cell from 2 to 3 times the length of the middle discocellular.

Scent Patches and Hair Pencils on Males:

Anteos—present in all species.
Old World Catopsilia—present in all species.
New World Catopsilia—absent in a number of species.
Gonepteryx—absent.

Raised Line:

Anteos—indistinct, running from inner margin into cell at or slightly above base of Cu_2.

Old World Catopsilia—indistinct, running from inner margin into cell at or slightly above base of Cu_2.

New World Catopsilia—

a. majority of species—runs from inner margin distad of cell, cutting M_3 distad of cell.

b. *agarithe* and *trite*—runs from inner margin into cell about base of Cu_1.

Gonepteryx—very distinct, running from inner margin distad of cell, cutting M_3 distad of the cell a distance equal to the length of the lower discocellular in *rhamni* and twice the length of the lower discocellular in *cleopatra*.

Harpe:

Anteos—wider than long.
Old World Catopsilia—wider than long.
New World Catopsilia—longer than wide.
Gonepteryx—longer than wide.

Dorsal Lobe a of Harpe:

Anteos—

a. *menippe*—absent or very weak.

b. *maerula* and *clorinde*—present, fairly strong, rounded, setiferous.
Old World Catopsilia—present, strong, rounded, setiferous.
New World Catopsilia—usually absent, very weak if present.
Gonepteryx—absent.

Dorsal Lobe b of Harpe:
Anteos—present.
Old World Catopsilia—present.
New World Catopsilia—present, very highly developed.
Gonepteryx—present, very simple.

Ventral Lobe a of Harpe:
Anteos—present, well developed, rounded, setiferous.
Old World Catopsilia—present, well developed, rounded, setiferous.
New World Catopsilia—very weak, seldom present.
Gonepteryx—absent.

Ventral Lobe b of Harpe:
Anteos—absent.
Old World Catopsilia—absent.
New World Catopsilia—absent.
Gonepteryx—present, small.

Basal Prong of Uncus:
Anteos—present.
Old World Catopsilia—present.
New World Catopsilia—absent.
Gonepteryx—absent.

Basal Prong of Penis:
Anteos—present.
Old World Catopsilia—present.
New World Catopsilia—absent.
Gonepteryx—absent.

Chitinous Teeth on Penis:
Anteos—present.
Old World Catopsilia—present, sometimes reduced.
New World Catopsilia—absent.
Gonepteryx—absent.

Saccus:
Anteos—short, thick, less than half the length of the vinculum.
Old World Catopsilia—short, thick, less than half the length of the vinculum.
New World Catopsilia—long, slender, more than 3/4 the length of the vinculum.

Gonepteryx—long, slender, more than 3/4 the length of the vinculum.

Distal Process of Harpe:
Anteos—short, curved (rounded in *maerula*).
Old World Catopsilia—short, rounded.
New World Catopsilia—long, strongly developed.
Gonepteryx—long, curved.

SUMMARY AND CONCLUSIONS.

A study of the foregoing data shows that *Anteos* is undoubtedly closely related to the Old World species of *Catopsilia,* while in almost every character it shows strong differences from *Gonepteryx.* Leaving aside the relationships of *Catopsilia,* which will be covered in a later paper, the writer postulates the following conclusions:

(1) *Anteos* Hübner is generically exceedingly distinct from *Gonepteryx* Leach.

(2) *Anteos* is closely related to the Old World species of *Catopsilia* and more distantly related to the New World species of *Catopsilia.*

(3) The species *menippe* Hübner should be placed in *Anteos,* where it forms a connecting link between the other two species and Old World *Catopsilia.*

GENERIC CHARACTERS, ANTEOS HÜBNER.

Size very large, averaging from 80–90 mm. Primaries above with a large brownish black discocellular dot. Males with a hair pencil on base of inner margin of primaries and a patch of scent scales on base of secondaries above Rs. Apex of primaries rounded, more or less falcate. R_4 and R_5 anastomosed, stalked with R_3. M_1 stalked on $R_3 + R_{4+5}$ more than half way from cell to base of R_{4+5}. Middle discocellular of both wings at least two-thirds as long as lower discocellular. Raised line on primaries above running from inner margin into cell at or slightly above base of Cu_2. Uncus with a basal prong. Saccus short, thick, less than half the length of the vinculum. Harpe short and wide with a short distal process, at least one dorsal lobe which is strongly chitinized along one edge, and a short rounded ventral lobe which bears strong setae. Penis with a strong basal prong and two or more strongly chitinized teeth distally.

KEY TO SPECIES, MALES. (*Superficial characters.*)

1. Primaries above with a narrow black apical border and an apical orange patch; apex of primaries not strongly falcate; secondaries not strongly tailed at M_1; scent patch extending from Rs to $Sc + R_1$ basally and apically along Rs past end of cell, brownish; inner margin of primary strongly bowed down at about middle; costa of primary lightly serrate. *menippe* Hübner.

Primaries above with no apical markings; apex of primaries strongly falcate; secondaries strongly tailed at M_1; scent patch whitish or not reaching $Sc + R_1$; inner margin of primary slightly bowed downward; costa of primary strongly serrate. 2

2. Wings above yellow, no discocellular dot on secondaries above; scent patch large, extending basally from Rs to $Sc + R_1$ and distally along Rs beyond cell, whitish. *maerula* Fabricius.

Wings above white with a transverse yellow-orange patch extending from costa of primaries across end of cell, and a brownish black discocellular dot on secondaries surrounded by a deep orange spot; scent patch small, not reaching half way from Rs to $Sc + R_1$, brownish ......*clorinde* Godart.

KEY TO SPECIES, MALES. (*Structural characters.*)

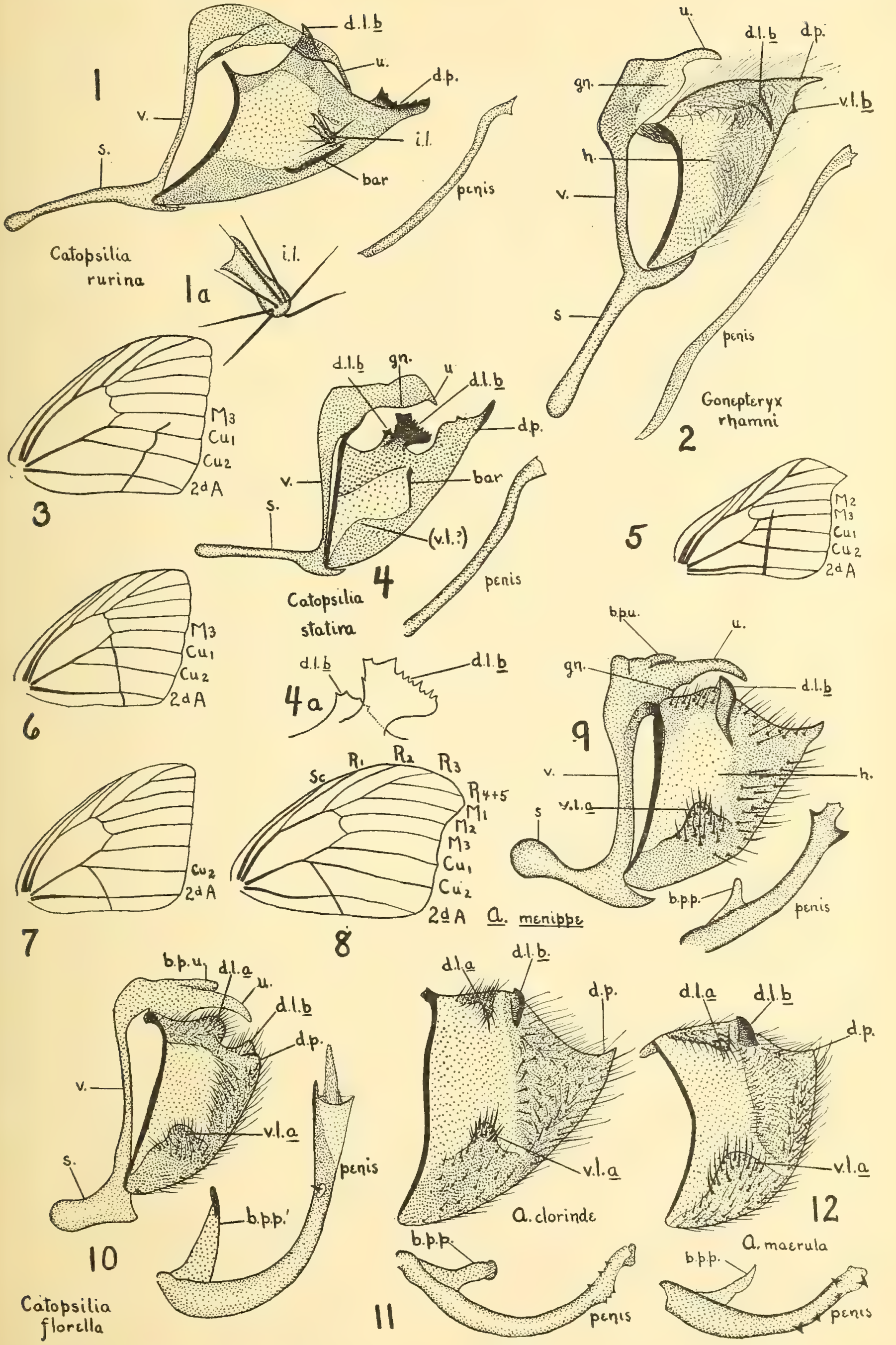
1. Distal process of harpe long and pointed; dorsal lobe *a* absent; dorsal lobe *b* longer than basal prong of penis; basal prong of penis short and rounded at the tip with no areas of heavier chitinization; penis with two large heavily chitinized teeth at tip. ....*menippe*

Distal process of harpe shorter, rounded or pointed; dorsal lobe *a* present; dorsal lobe *b* shorter than basal prong of penis; basal prong of penis long, with the tip either pointed or with a more heavily chitinized cap; penis with a number of small heavily chitinized teeth on distal half. 2

2. Distal process of harpe pointed; both dorsal lobe *a* and ventral lobe narrow, well differentiated from infolding of edge of harpe; penis with a more heavily chitinized cap on both tip of basal prong of penis and of penis itself; teeth on penis small, limited to distal quarter. ....*clorinde*

Distal process of harpe blunt; both dorsal lobe *a* and ventral lobe hardly differentiated from infolding of edge of harpe except by setiferous area; basal prong of penis and penis itself with no more heavily chitinized cap on tip; teeth on penis larger, not limited to distal third .... *maerula*

PLATE XX


1
d.l.b
u.
d.p.
v.
i.l.
s.
bar
penis
Catopsilia rurina
i.l.
1a
u.
d.l.b
d.p.
gn.
v.l.b
h.
v.
s
penis
Gonepteryx rhamni
2
M3
Cu1
Cu2
2d A
3
d.l.b
gn.
u
d.l.b
d.p.
v.
bar
s.
(v.l.?)
penis
Catopsilia statira
4
M2
M3
Cu1
Cu2
2d A
5
M3
Cu1
Cu2
2d A
6
d.l.b
d.l.b
4a
b.p.u.
u.
gn.
d.l.b
9
v.
h.
v.l.a
s
b.p.p.
penis
Sc
R1
R2
R3
R4+5
M1
M2
M3
Cu1
Cu2
2d A
a. menippe
8
Cu2
2d A
7
b.p.u.
d.l.a
u.
d.l.b
d.p.
v.
v.l.a
s.
penis
b.p.p.'
10
Catopsilia florella
d.l.a
d.l.b.
d.p.
v.l.a
a. clorinde
b.p.p.
penis
11
d.l.a
d.l.b
d.p.
v.l.a
12
a. maerula
b.p.p.
penis

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EXPLANATION OF FIGURES.

Fig. 1. Lateral aspect ♂ genitalia *Catopsilia rurina* Felder, left harpe removed showing ental aspect of right harpe.
Fig. 1a. Enlarged drawing of *inner lobe* of above.
Fig. 2. Lateral aspect ♂ genitalia *Gonepteryx rhamni* L., left harpe removed showing ental aspect of right harpe.
Fig. 3. Venation of primary, *Catopsilia philea* L., showing position of *raised line.*
Fig. 4. Lateral aspect ♂ genitalia *Catopsilia statira* Cramer, left harpe removed showing ental aspect of right harpe.
Fig. 4a. Enlarged drawing of *dorsal lobe b* of above.
Fig. 5. Venation of primary, *Gonepteryx rhamni* L., showing position of *raised line.*
Fig. 6. Venation of primary, *Catopsilia argante* Fabricius, showing position of *raised line.*
Fig. 7. Venation of primary, *Catopsilia florella* Fabricius, showing position of *raised line.*
Fig. 8. Venation of primary, *Anteos clorinde* Godart, showing position of *raised line.*
Fig. 9. Lateral aspect ♂ genitalia *Anteos menippe* Hübner, left harpe removed showing ental aspect of right harpe.
Fig. 10. Lateral aspect ♂ genitalia *Catopsilia florella* Fabricius, left harpe removed showing ental aspect of right harpe.
Fig. 11. Ental aspect of right harpe and lateral aspect of penis, *Anteos clorinde.*
Fig. 12. Ental aspect of right harpe and lateral aspect of penis, *Anteos maerula* Fabricius.

LIST OF SYMBOLS.

bar = chitinized bar of harpe.
b.p.p. = basal prong of penis.
b.p.u. = basal prong of uncus.
d.l.*a*. = dorsal lobe *a*.
d.l.*b*. = dorsal lobe *b*.
d.p. = distal process of harpe.
gn. = gnathos.
h. = harpe.
i.l. = inner lobe.
s. = saccus.
u. = uncus.
v. = vinculum.
v.l.*a*. = ventral lobe *a* of harpe.
v.l.*b*. = ventral lobe *b* of harpe.

RECTIFICATIONS FOR BLATCHLEY'S "HETEROPTERA" WITH THE DESCRIPTION OF A NEW SPECIES (HEMIPTERA).

By Harry H. Knight, Ames, Iowa.

In a recent number of this journal,[1] Dr. W. S. Blatchley has published an article entitled "Quit-claim specialists *vs.* the making of manuals." Among sundry items he has made statements concerning the status of certain species of Miridae which require further comment.

Blatchley refers to my paper (Ent. News, xxxvii, 1926 (Oct.), pp. 258–262) in which new varieties of *Paracalocoris externus* (H. S.) are described, as "issued Dec. 20, 1926." He is mistaken in this since the October number of Entomological News (1926) was issued October 15, 1926. Such being the case Dr. Blatchley is not obliged to assume authorship of these color varieties which he names "spotted-dogs."

Eustictus filicornis (Walker).

1873 *Capsus filicornis* Walker, Cat. Heter., vi, p. 96.
1886 *Megacoelum filicornis* Uhler, Check List, p. 18.
1887 *Megacoelum grossum* Uhler, Ent. Amer., iii, p. 70.
1904 *Creontiades filicornis* Distant, Ann. Mag. Nat. Hist. (ser. 7), xiii, p. 106.
1909 *Eustictus grossus* Reuter, Acta Soc. Sci. Fenn., xxxvi, No. 2, p. 35.
1917 *Cimatlan grossum* Van Duzee, Cat. Hemiptera, p. 352.
1923 *Eustictus grossus* Knight, Hem. Conn., p. 484.
1926 *Creontiades filicornis* Blatchley, Het. E. N. Amer., p. 733.
1926 *Eustictus grossus* Blatchley, Het. E. N. Amer., p. 884.
1927 *Eustictus filicornis* Knight, Bul. Brook. Ent. Soc., xxii, p. 101.
1928 *Creontiades filicornis* Blatchley, Bul. Brook. Ent. Soc., xxiii, p. 16.
1928 *Eustictus filicornis* Blatchley, Jl. N. Y. Ent. Soc., xxxvi, p. 11.

In commenting on this species I wrote (1927) as follows: "Mr. W. E. China writes me that the type *filicornis* Walk. runs in my keys (Hemiptera of Connecticut) to *Eustictus grossus*

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[1] Bul. Brook. Ent. Soc., XXIII, 1928, pp. 10–18.

Uhler. Since this species is such a distinct form there could scarcely be any mistake in placing it in the keys. It is regrettable that Uhler's distinctive name should pass into synonymy but the evidence seems rather conclusive." In referring to this species, Dr. Blatchley (1928, p. 16) asks this question: "If Knight thinks that *filicornis* is 'such a distinct form that there could scarcely be any mistake in placing it in the keys,' why did he not place it in his 'Monograph of Deraeocoris' and in the Hemiptera of Connecticut?"

Since the above (1927) was written I have sent a specimen of *grossus* Uhl. to Mr. China at the British Museum for comparison with the type of *filicornis* Walker and he reports that the specimens undoubtedly belong to the same species.

Labops hirtus Knight.
1922 *Labops hirtus* Knight, Can. Ent., liv, p. 258.
1923 *Labops hirtus* Knight, Hem. Conn., p. 501.
1926 †*Labops hesperius* Blatchley, Het. E. N. Amer., p. 797.
1927 *Labops hirtus* Knight, Bul. Brook. Ent. Soc., xxii, p. 101.
1928 †*Labops hesperius* Blatchley, Bul. Brook. Ent. Soc., xxiii, p. 16.

In my last reference to this species (1927), I took space to again point out the differences between *hesperius* Uhl. and *hirtus* Kngt., distinctions which are plainly evident to all students who have compared the two species. I am pleased to say that in September, 1928, Mr. Van Duzee visited with us at Ames, when I had opportunity to have him compare types of *hirtus* Kngt. with specimens of *hesperius* Uhl. that had been compared with the type in the U. S. N. M. Mr. Van Duzee was free to admit that the two species are certainly distinct, and that he evidently did not have the true *hesperius* Uhl. until I sent him specimens.

Barberiella apicalis Knight.
1923 *Barberiella apicalis* Knight, Hem. Connecticut, p. 657.
1926 *Pilophorus brimleyi* Blatchley, Ent. News, xxxvii, p. 165.
1926 *Pilophorus brimleyi,* Blatchley, Het. N. E. Amer., p. 808.
1927 *Barberiella apicalis* Knight, Bul. Brook. Ent. Soc., xxii, p. 102.
1928 *Barberiella brimleyi* Blatchley, Bul. Brook. Ent. Soc., xxiii, p. 17.

1928 *Barberiella brimleyi* Blatchley, Jl. N. Y. Ent. Soc., xxxvi, p. 12.

Through the kindness of Mr. C. S. Brimley, I was able to examine the type of *Pilophorus brimleyi* Blatchley while passing through Raleigh, N. C., in September, 1926. At that time I told Mr. Brimley that the type was the same as my *Barberiella apicalis* or a closely allied form, but I did not wish to commit myself positively until I returned home to examine the type of *apicalis* Kngt. Arriving home I examined the type of *apicalis* and became convinced that *brimleyi* Blat. is identical. Not satisfied with this, Dr. Blatchley (1928) states his opinion that his *brimleyi* remains distinct until the types are compared side by side. Such a comparison was entirely agreeable to me, thus I suggested to Mr. Brimley that we send our types to the U. S. National Museum where various specialists could check the comparison. Mr. Brimley very kindly sent his type for this purpose so we were able to get an " official verdict."

Concerning this comparison of the types, Dr. Harold Morrison wrote as follows: " I have finally gotten through with what I consider to be a critical comparison of your holotype of *Barberiella apicalis* and the type of *Pilophorus brimleyi* Blatchley. As a result of this examination it is my opinion that the two specimens represent the same species." Further: " Mr. McAtee has examined the two specimens and has expressed to me his belief that they represent the same species."

A few days later Dr. C. J. Drake visited Washington and made comparison of the types. He also reported that the type specimens undoubtedly belong to the same species.

Pilophorus strobicola Knight.

1923 †*Pilophorus amoenus* Drake, N. Y. St. Col. For., Tech. Pub. 16 (1922), p. 78, fig. 31.

1923 †*Pilophorus crassipes* Knight, Hem. Connecticut, p. 542.

1926 *Pilophorus strobicola* Knight, Bul. Brook. Ent. Soc., xxi, p. 19.

1926 †*Pilophorus amoenus* Blatchley, Het. N. E. Amer., p. 812, fig. 179.

As yet I have been unable to find that I ever made the mistake of labeling this species as *amoenus* Uhler. In Dr. Drake's collection I find a specimen of this species bearing the label " *Pilophorus amoenus* " but not in the hand of the present writer. I examined the type of *amoenus* Uhler first in 1915 and have had compared specimens in my collection ever since. In the "Hemiptera of Connecticut" I considered this species to represent *crassipes* Popp., but later, after examining Poppius's type specimens, I found the species to be still undescribed, hence the name *Pilophorus strobicola* Knight (1926).

Dicyphus vestitus Uhler.

1895 *Dicyphus vestitus* Uhler, Hem. Colorado, p. 46.
1917 *Dicyphus vestitus* Van Duzee, Cat. Hemiptera, p. 371.
1922 *Dicyphus notatus* Parshley, S. Dak. St. College, Tech. Bul. 2, p. 16.
1926 *Dicyphus notatus* Blatchley, Het. N. E. Amer., p. 909.
1927 *Dicyphus vestitus* Knight, Bul. Brook. Ent. Soc., xxii, p. 104.
1928 *Dicyphus vestitus* Walley, Can. Ent., lx, p. 119.

When Mr. Van Duzee visited Ames last fall (1928), we looked over the species of Dicyphus, and I am glad to say that we both agree on the identity of *vestitus* Uhl. In his Manual, Dr. Blatchley placed *gracilentus* Parshley as a synonym of *vestitus* Uhler, but I find in checking his description of *vestitus,* it actually applies to *gracilentus* Parsh. Dr. Blatchley states (1928) that he "sent in exchange specimens of what I determined as *D. gracilentus* Parshley to E. P. Van Duzee" who determined the same as *vestitus* Uhler. Is it not possible that Mr. Blatchley actually sent *vestitus* Uhler to Mr. Van Duzee, but under the name of *gracilentus* Parshley?

Dicyphus vestitus Uhler does occur in Illinois, Indiana, and Ohio, as there are such specimens in my collection. For a key to species of Dicyphus which is based on authentic material, see the paper by Mr. G. S. Walley (Can. Ent., lx, 1928, p. 119).

Dicyphus gracilentus Parshley.

1923 *Dicyphus gracilentus* Parshley, Ent. News, xxxiv, p. 21.
1926 †*Dicyphus vestitus* Blatchley, Het. N. E. Amer., p. 910.
1927 *Dicyphus gracilentus* Knight, Bul. Brook. Ent. Soc., xxii, p. 104.
1928 *Dicyphus gracilentus* Walley, Can. Ent., lx, p. 119.

I have pointed out above how Dr. Blatchley's description under the name *Dicyphus vestitus* Uhler actually refers to *gracilentus* Parshley. In a previous paper (1927) I pointed out some of the differences between *gracilentus* Parsh. and *vestitus* Uhler which need not be repeated here. For a key to the eastern species of Dicyphus see the paper by Walley (1928).

The writer published a key to the species of *Macrolophus* (Ent. News, xxxvii, 1926, pp. 313–316) describing two new species. While this paper was in press the description of *M. tenuicornis* Blatchley appeared, and I expect it may prove to be the same as my *longicornis.* However, Dr. Blatchley describes his *tenuicornis* thus: "joint 1 yellow, the extreme tip and base blackish, more than twice as long as width of vertex." Also: "joint 2, three times as long as 1." These relative lengths, if correct, should separate my *longicornis* from *tenuicornis* Blat. But these discrepancies may arise from the more accurate measurements with a micrometer. In *longicornis* Kngt. antennal segment I (.51 mm.) is scarcely equal to twice the width of vertex, black in color with a suggestion of paler at middle; segment II (1.32 mm.) is only 2.6 times the length of segment I.

Unfortunately, two printers' errors occur in my paper on Macrolophus. One error in the key where "not" was left out of the first line was corrected by the editor in the following number of Ent. News. The other I find in the description of antennal segments I and II of *longicornis.* It should read thus: antennal segment I, length .51 mm., black, slightly paler on middle; II, 1.32 mm., pale, apex blackish.

The writer pointed out in an earlier paper (1927) the incomplete and misleading records for specimens redescribed by Dr. Blatchley in his Manual. Accordingly, I made a list of the records from Dr. Blatchley's book which I knew to be material collected and determined by myself, and in a few cases specimens collected by others but determined by me and placed in the Minnesota University collection. I sent a list of 60 species of Miridae, which Dr. Blatchley designates "(*Minn. Univ. Coll.*)" following the month and day which he cites, to Dr. C. E. Mickel now in charge of the Minnesota collection, with the request that he fill in the missing data just as he finds it on the pin labels. Dr. Mickel very kindly complied with this request thus I present the records as returned to me. The name of the species is given first, after that the month and day as recorded by Dr. Blatchley, and following that in brackets is the data supplied by Dr. Mickel, indicating the collector. Specimens bearing paratype labels are also indicated. Many of these specimens represent first records for the state of Minnesota and as such I wish to have them recorded with complete data.

1. *Psallus piceicola* Kngt. Canby, Minn., June 24 [H. H. Knight].
2. *Psallus parshleyi* Kngt. Hennepin Co., Minn., Aug. 2 [H. H. Knight, paratype].
3. *Psallus morrisoni* Kngt. Cramer, Minn., Aug. 10 [H. H. Knight].
   Lake Co., Minn., Aug. 15 [H. H. Knight].
4. *Psallus alnicenatus* Kngt. Ithaca, New York, July 26 [H. H. Knight, paratype].
5. *Psallus strobicola* Kngt. St. Anthony Pk., Minn., July 14 [H. H. Knight].
6. *Campylomma verbasci* Mey. Le Sueur Co., Minn., Sept. 13 [no collector named].
7. *Chlamydatus pulicarius* (Fall.). Rock City, New York, July 4 [H. H. Knight].
8. *Microsynamma bohemanni* Fall. Honeoye Falls, N. Y., June 27 [H. H. Knight].
9. *Plagiognathus caryae* Kngt. Ithaca, N. Y., June 22 [H. H. Knight, paratype].
10. *Plagiognathus delicatus* Uhl. Batavia, N. Y., June 25 [H. H. Knight].
11. *Plagiognathus chrysanthemi* (Wolff). Ithaca, N. Y., June 30 [no collector].
12. *Plagiognathus punctatipes* Kngt. Ithaca, N. Y., June 27 [H. H. Knight, paratype].
13. *Plagiognathus alboradialis* Kngt. Cranberry Lake, N. Y. [C. J. Drake, paratype].
14. *Plagiognathus laricicola* Kngt. Ithaca, N. Y., June 27 [H. H. Knight, paratype].
15. *Plagiognathus repetitus* Kngt. Whiteface, Mt., N. Y., Aug. 22 [H. H. Knight, paratype].
16. *Microphylellus tsugae* Kngt. Tompkins Co., N. Y., July 3 [H. H. Knight, paratype].
17. *Microphylellus nigricornis* Kngt. Ithaca, N. Y., July 7 [H. H. Knight, paratype].
18. *Microphylellus maculipennis* Kngt. St. Anthony Pk., Minn., June 10 [H. H. Knight, paratype].
19. *Macrotylus sex-guttatus* Prov. Cook Co., Minn., Aug. 14 [H. H. Knight].
20. *Eustictus salicicola* Kngt. New Ulm, Minn., June 20 [H. H. Knight, paratype].
    St. Paul, Minn., July 18 [H. H. Knight, paratype].

21. *Noctuocoris fumidus* V. D. St. Anthony Pk., Minn., June 25 [W. E. Hoffmann].
22. *Orthotylus modestus* V.D. Batavia, N. Y., July 19 [H. H. Knight].
23. *Orthotylus alni* Kngt. Beaver Bay, Minn., Aug. 20 [H. H. Knight].
24. *Orthotylus serus* V. D. Batavia, N. Y., July 5 [H. H. Knight].
25. *Orthotylus submarginatus* Say. Ithaca, N. Y., July 7 [H. H. Knight].
26. *Orthotylus necopinus* V. D. Fairbault, Minn., June 12 [H. H. Knight].
27. *Orthotylus candidatus* V. D. Two Harbors, Minn., Aug. 9 [H. H. Knight].
28. *Diaphnidia capitata* V. D. Cloquet, Minn., Aug. 1 [A. A. Nichol].
29. *Diaphnidia provancheri* (Burque). St. Anthony Pk., June 18 [H. H. Knight].
30. *Lopidea salicis* Kngt. Ramsey Co., Minn., June 27 [H. H. Knight].
31. *Lopidea cuneata* V. D. Gray Cloud Is., Minn., July 12 [H. H. Knight].

    Ramsey Co., Minn., July 20 [H. H. Knight].
32. *Ilnacora divisa* Reut. Ft. Snelling, Minn., July 12 [A. T. Hertig].
33. *Lopidea marginalis* Reut. Willow River, Minn., Aug. 7 [H. H. Knight].
34. *Ceratocapsus incisus* Kngt. Ithaca, N. Y., July 26 [H. H. Knight, paratype].
35. *Ceratocapsus fuscinus* Kngt. Batavia, N. Y., Aug. 10 [H. H. Knight, paratype].

    Ramsey Co., Minn., July 11 [H. H. Knight].
36. *Ceratocapsus nigrocephalus* Kngt. St. Anthony Pk., Minn., July 5–6 [H. H. Knight].
37. *Pilophorus juniperi* Kngt. Gray Cloud Is., Minn., July 20 [H. H. Knight, paratype].
38. *Pilophorus uhleri* Kngt. Batavia, N. Y., July 14 [H. H. Knight, paratype].

    Olivia, Minn., June 28 [H. H. Knight, autotype].
39. *Xenoborus pettiti* Reut. Ramsey Co., Minn., June 15 [H. H. Knight].

40. *Xenoborus plagifer* Reut. Carlton Co., Minn., Aug. 18 [H. H. Knight].
41. *Neoborus rufusculus* Kngt. Lakeland, Minn., June 14 [H. H. Knight].
42. *Neoborus glaber* Kngt. St. Anthony Pk., Minn., June 6 [H. H. Knight].
43. *Lygus alni* Kngt. Beaver Bay, Minn., Aug. 20 [H. H. Knight].
44. *Lygus approximatus* Stål. Whiteface Mt., N. Y., Aug. 22 [H. H. Knight].
45. *Lopidea lathyri* Kngt. Anoka Co., Minn., July 6 [H. H. Knight, paratype].
46. *Platylygus luridus* Reut. Ithaca, N. Y., July 13 [H. H. Knight].
47. *Lygidea obscura* Reut. Honeoye Falls, N. Y., June 27 [H. H. Knight].
48. *Lygidea viburni* Kngt. Batavia, N. Y., June 24 [H. H. Knight, paratype].
49. *Dichrooscytus viridicans* Kngt. New Ulm, Minn., June 20 [H. H. Knight].
50. *Phytocoris depictus* Kngt. St. Anthony Pk., Minn., Aug. 11. [There is a series of specimens (paratypes) of this date, collector H. H. Knight; there is also one specimen of this date, no collector label. I do not know which one I sent.]
51. *Phytocoris erectus* V. D. Norman Co., Minn., July 17 [A. A. Nichol].
52. *Phytocoris spicatus* Kngt. Norman Co., Minn., June 25 [A. A. Nichol].
53. *Phytocoris pinicola* Kngt. Ithaca, N. Y., July 11 [H. H. Knight].
54. *Phytocoris diversus* Kngt. Carlton Co., Minn., Aug. 18 [H. H. Knight].
55. *Phytocoris sulcatus* Kngt. St. Anthony Pk., Minn., Aug. 5 [H. H. Knight].
56. *Phytocoris corticevivens* Kngt. Ramsey Co., Minn., June 2 [no such specimen in our collection].
57. *Phytocoris conspurcatus* Kngt. St. Anthony Pk., Minn., Aug. 5 [H. H. Knight].
58. *Paracalocoris heidemanni* Reut. LeRoy, Alabama, June 12 [H. H. Knight].

59. *Platytylellus borealis* Kngt. Morrison Co., Minn., July 10 [A. A. Nichol].
60. *Platytylellus rubellicollis* Kngt. St. Anthony Pk., Minn., June 2. [There are specimens dated July 2 and June 21, both collected (H. H. Knight), but no specimen of June 2 in our collection.]

A good many species credited to Mr. Gerhard in Blatchley's Manual were collected, named and presented to Mr. Gerhard by myself. Accordingly, I made up a list of 21 species and sent to Mr. Gerhard with request for complete record of data on the labels. Mr. Gerhard very kindly complied with this request, thus I present the data in brackets.

1. *Phytocoris fulvus* Kngt. Wanakena, N. Y., Aug. 1–7 [Col. by C. J. Drake, det. by H. H. Knight; paratype].
2. *Lygus belfragii* Reut. Batavia, N. Y., July 31 [H. H. Knight, det. H. H. Knight; 2 paratypes].
3. *Lygus tiliae* Kngt. Portage, N. Y., June 27 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
4. *Lygus viburni* Kngt. Batavia, N. Y., June 15 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
5. *Lygus atritylus* Kngt. Wanakena, N. Y., July 15 [Col. C. J. Drake, det. H. H. Knight].
6. *Lygus ostryae* Kngt. Portage, N. Y., June 27 [Col. H. H. Knight, det. H. H. Knight; paratype].
   Parry Sound, Ont., Aug. 7 [Col. H. S. Parish, det. H. H. Knight; paratype].
7. *Lygus geneseensis* Kngt. Portage, N. Y., June 22 [Col. H. H. Knight, det. H. H. Knight; paratype].
8. *Lygus johnsoni* Kngt. McLean, N. Y., July 27 [Col. H. H. Knight, det. H. H. Knight; paratype].
   Ithaca, N. Y., June 20 [Col. H. H. Knight, det. H. H. Knight; compared with type].
9. *Lygus communis* Kngt. Batavia, N. Y., Aug. — [Col. H. H. Knight, det. H. H. Knight; 4 paratypes].
10. *Lygus univittatus* Kngt. Ithaca, N. Y., June 23 [Col. H. H. Knight, det. H. H. Knight; compared with type].
11. *Lygus laureae* Kngt. Rock City, N. Y., July 4 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
12. *Lopidea lathyri* Kngt. Anoka Co., Minn., July 6 [Col. H. H. Knight, det. H. H. Knight; paratype].

13. *Lopidea amorphae* Kngt. Ramsey Co., Minn., July 8, 18 [Col. H. H. Knight, det. H. H. Knight; paratype].
14. *Orthotylus knighti* V. D. Attica, N. Y., July 6 [Col. H. H. Knight, det. H. H. Knight; compared with type].
15. *Orthotylus ornatus* V. D. Honeoye Falls, N. Y., June 27 [Col. H. H. Knight, det. H. H. Knight; compared with type].
16. *Deraeocoris betulae* Kngt. Ithaca, N. Y., July 2 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
17. *Deraeocoris alnicola* Kngt. McLean Bogs, Tompkins Co., N. Y., July 3 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
18. *Deraeocoris aphidiphagus* Kngt. Twin Lake, Minn., July 3 (June 29) [Col. H. H. Knight, det. H. H. Knight; paratype].
19. *Deraeocoris nitenatus* Kngt. St. Anthony Pk., Minn., Aug. 5 [Col. H. H. Knight; compared with type].
20. *Deraeocoris laricicola* Kngt. Ithaca, N. Y., June 27 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].
21. *Deraeocoris pinicola* Kngt. Ithaca, N. Y., July 13 [Col. H. H. Knight, det. H. H. Knight; 2 paratypes].

A synonym occurs in the paper published by Dr. Blatchley (Ent. News, xxxvii, 1926, pp. 163–169), in which he describes six species of Miridae. Three of these are synonyms and now *Sixeonotus albicornis* Blat. is shown to be identical with *Sixeonotus insignis* Reuter (1876). For some time I have been convinced that a southern species of *Sixeonotus* which I have from Texas, Mississippi, and Florida, represents *insignis* Reut. described from Texas in 1876, while the more northern species from Maryland, District of Columbia, and North Carolina which Reuter (1909) determined as his *insignis*, is in fact an unnamed species.

During the past year I have been favored with the much appreciated services of Dr. H. B. Hungerford in making some comparisons with Reuter's types of 1876 which are still preserved in the National Museum at Stockholm. The essential facts concerning the comparison of specimens with the type of *Sixeonotus insignis* Reuter, I quote from Dr. Hungerford's letter as follows: "*Sixeonotus insignis* Reut., 7 specimens, 3 ♂, 3 ♀, and one pasted so I can not tell; a ♂ is marked type and each specimen bears the two labels: 'Texas,' 'Belfrage.' At London, using Blatchley's book, we had determined the Florida specimens to be *Sixeonotus albicornis* Blatch. and the N. C. specimens as *S. insignis* Reut., and so reported to you. In comparing these two species of yours I find that *S. insignis* Reuter is like the Florida specimens. Therefore what China and I reported to you as *S. albicornis* Blatch. is Reuter's *S. insignis,* and the N. C. species is something else. After I had come to this conclusion I noticed that I could see the claspers in one of the type specimens, and then relaxed and brought to view the claspers in your insects which confirmed my decision. So there you are!"

The results of this comparison are very interesting in view of the fact that I sent Dr. Hungerford two species of Sixeonotus without indicating any names, and merely asked him to compare the specimens with the type of *Sixeonotus insignis* Reuter (1876) and let me know if any of my specimens proved identical. Dr. Hungerford's findings agree exactly with the conclusions I had reached after a study of original descriptions and the known distribution of the species concerned. A description of the unnamed species follows:

Sixeonotus recurvatus n. sp.

Allied to *insignis* Reut., but distinguished by structure of the genital claspers, larger and broader form, and by the longer and more prominent pubescence on the hemelytra.

♂. Length 3.6 mm., width 1.8 mm. Head: width .72 mm., vertex .47 mm. Rostrum, length .83 mm., reaching to near hind margin of sternum, pale. Antennae: segment I, length .32 mm.; II, .65 mm., III, .56 mm.; IV, .74 mm.; pale, last two segments becoming fuscous. Pronotum: length .98 mm., width at base 1.5 mm.; basal margin strongly sinuate on middle, covering base of scutellum; disk more strongly inflated and coarsely punctate, and lateral margins more concavely angulated than in *insignis.*

Black, shining, hemelytra only slightly shining; legs, rostrum, and ostiolar peritreme, tips of tarsi and the claws fuscous, lora and sutures of juga somewhat pale. Membrane and veins black, apical half beyond the veins, pale. Clothed with rather prominent pale pubescence, distinctly longer and more erect on hemelytra than in *insignis.* Genital characters distinctive; left clasper with the slender distal arm recurved away from the triangular base.

♀. Length 3.2 mm., width 1.7 mm. Head: width .74 mm., vertex .49 mm. Antennae: segment I, length .27 mm.; II,

.56 mm.; III, .49 mm.; IV, .72 mm. Pronotum: length .87 mm., width at base 1.4 mm. Very similar to the male in coloration, pubescence and puncturation.

Holotype: ♂, July 12, 1926, Washington, D. C. (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratype:* ♂, taken with the type on Pale Indian Plantain (*Cacalia atriplicifolia*). ♂ ♀, June 8, 1905, Plummer's Island, Md. (O. Heidemann). 12 ♂ ♀, June 15 to July 13, 1912, Black Mountains, N. C. (Beutenmuller).

The generic name *Sixeonotus* Reuter is misspelled in all cases in the Manual as well as in a previous article (Ent. News, 1926, pp. 167–168).

Blatchley's description of *Paracalocoris heidemanni* is based on specimens which I collected at LeRoy, Alabama, June 12, 1917, and left determined in the Minnesota University collection as *heidemanni* Reut. Since that time I have found the Alabama specimens represent another species and therefore described the same as *Paracalocoris breviatus* Knight (Ann. Ent. Soc. Am., xix, 1926, p. 372).

An Early Cerambycid.—On March 10, 1929, while walking home about noon on the main street of Framingham a specimen of *Hylotrupes ligneus* Fab. alighted on my vest. The temperature in the shade was at 62 degrees F. I have never before taken this orange-colored form in this locality but I have a specimen from Worcester, Mass., taken April 20, 1915, one from Malcolm, Neb., dated May 12, 1909, and one from "3-Rivieres, Can.," dated April 13, 1916. A specimen from the same place and with the same date as the last mentioned answers very well to the description of *H. nicolas* White as given by Casey in his 1912 Memoir on page 274. Two other specimens of this genus were taken here in wash-up on May 14, 1909, and May 3, 1912; they are entirely brownish-black and until a careful study of the genus is made it is useless to attempt to place them specifically. I use the old generic name *Hylotrupes* in preference to making annual changes in my labels in trying to follow taxonomic flip-flops.—C. A. Frost, Framingham, Mass.

NOTES ON GYRINUS MARGINELLUS FALL.

By K. F. Chamberlain, Assistant Entomologist, New York State Museum.

There is an old saying among entomologists that: " No species is rare if you know where to look for it." The following experiences seem to bear witness to the truth of this statement.

Up to the present time *Gyrinus marginellus* Fall has been exceedingly scarce in collections. Mr. Fall, the describer, informs me that his type series contained only three specimens and no additional material came to light until the writer discovered this species under rather unusual conditions at Cornwall, Connecticut, the latter part of August, 1925. On this occasion I went out one afternoon to secure some specimens of *Hydroporus mellitus* Lec. for a correspondent and proceeded directly to a rather large, sluggish stream where I had previously found this little Dytiscid in some numbers. The method of securing the Hydroporus consisted of wading the stream and dredging, with a long-handle coffee-strainer net, in the deep cavities under the banks which had been excavated by the water in time of floods. These miniature caves were usually to be found at points where the brook swept around broad curves. The stream flowed through a large meadow; the banks were several feet high and the long grass had become matted down and, trailing in the water, formed a sort of curtain or screen in front of the excavations. Here, among the grass and a sparse growth of aquatic vegetation, the little *Hydroporus mellitus* were usually to be found together with *H. spurius* Lec., *Deronectes depressus* Fab., *Bidessus affinis* Say, interesting little *Helmidae* and other aquatic forms. After securing a number of *H. mellitus* by dredging in these situations I moved on to a particularly inviting looking spot where I was able to thrust the net back under the banks several feet. Almost at once I began to get specimens of a small species of *Gyrinus* and after securing a sample of these, ignored the rest in favor of other supposedly more interesting things. When I returned home, mounted and examined these, my surprise and pleasure can readily be imagined when I discovered that they were *Gyrinus marginellus* Fall—a species supposedly rare and entirely new to my collection. Within a few days, as soon as time would permit, I again visited this spot and before disturbing it examined the surface of the water carefully for *Gyrinus*. None was visible. Upon dredging as before, however, they soon appeared in my net and a hundred or more were captured in a short time. Repeated invasions with the net drove some of them out into open water where they gyrated madly for a few moments and then gradually disappeared, returning, perhaps, to their strange dwelling place. Back of the grass "curtain" it was dim twilight and the banks arched high enough to permit a large school of *Gyrinus* to occupy the placid surface.

Some eight months later, on May 2nd, 1926, to be exact, I was collecting at Montvale, New Jersey, when I came upon a stream very similar to the one described above although not nearly as wide. Upon approaching close to the edge I noticed that the bank sagged under my weight, indicating a cavity beneath. There were a few *Dineutes vittatus* Germ. swimming in the main stream but I noticed no *Gyrinus*. With the purpose of investigating what might lie beneath the bank I pushed the whole section upon which I stood down into the water. Almost immediately a number of small *Gyrinus* appeared on the muddy surface. These were quickly netted and upon examination the following day proved to be *Gyrinus marginellus*. Here, then, is the same species living under precisely similar conditions in two widely separated localities. Does *Gyrinus marginellus* habitually seek out and spend its life in the dark cavities beneath the banks of running streams? The meagre evidence at hand points that way, the scarcity of the species in collections helps to confirm it, yet it still remains a matter for careful investigation.

Rarity versus Secrecy.—My second specimen of *Coxelus guttulatus* Lec. has turned up after an interval of nearly eight years. On April 28th I found a specimen cunningly hidden beneath the bark of a dead pitch pine in Natick, Mass. The first one I ever saw was found under the bark of a pine stump in Framingham on September 5, 1921. It was even less conspicuous in its hiding place than the second one.—C. A. Frost, Framingham, Mass.

OBSERVATIONS ON METROBATES HESPERIUS UHLER (HEMIPTERA–GERRIDAE).

I. Pterygopolymorphism.[1]

By H. M. Parshley.

For some years I have felt a special interest in *Metrobates hesperius* Uhler, and now I propose to add from time to time to the little that is known about the species. It belongs to the Halobatinae, and is thus related to the sea-going water-striders of the genus *Halobates,* which it resembles in size and shape. Our species, however, lives inland, on bodies of fresh water, being found near the shores of large lakes and also on the pools that form below rapids and waterfalls. It is by no means uncommon, but it is decidedly local in occurrence, most collectors knowing of only one or two places where it can be taken. I have found it extremely abundant on the series of lakes at Cold Spring Harbor, on Long Island.

Like many other Gerridae, *M. hesperius* presents diverse adult forms with respect to wing development; and it is this phenomenon of pterygopolymorphism that forms the subject of the present paper. Two forms exist in this species: the macropterous, or fully winged, and the apterous, or wingless. It has been the almost universal experience of collectors to find the macropterous form extremely rare, even in localities where the apterous is abundant enough to populate the surface thickly over considerable areas, just as in other gerroid species the fully winged form, the short winged, or the wingless may predominate. Why these various relations should obtain in closely allied species under similar environmental conditions is a question that remains unanswered, though a good deal of attention has been paid to it.

On July 22, 1926, at Cold Spring Harbor I found the species abundant as usual, and, sweeping up a few according to custom to look for winged examples, I saw that half the number in the net were macropterous. Here in a moment I had caught more specimens of the rare form than in all my previous experience. In fact, I had never collected it, save from the cabinets of generous colleagues. So I gathered up a great many, adults and nymphs, and took them into the laboratory for counting. Of the 503 adults, 234 were wingless and 269 were winged. Never before or since have I found a winged individual in that spot, and only one or two elsewhere. Among the last stage nymphs many indicated by the possession of wing-pads that they were about to develop into macropterous adults, but the younger generation already showed a great falling off in the ratio of winged to wingless individuals. I preserved about 40, those which were alate among several hundred examined, but I failed to make an exact count.

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[1] Contributions from the Department of Zoology, Smith College, No. 156.

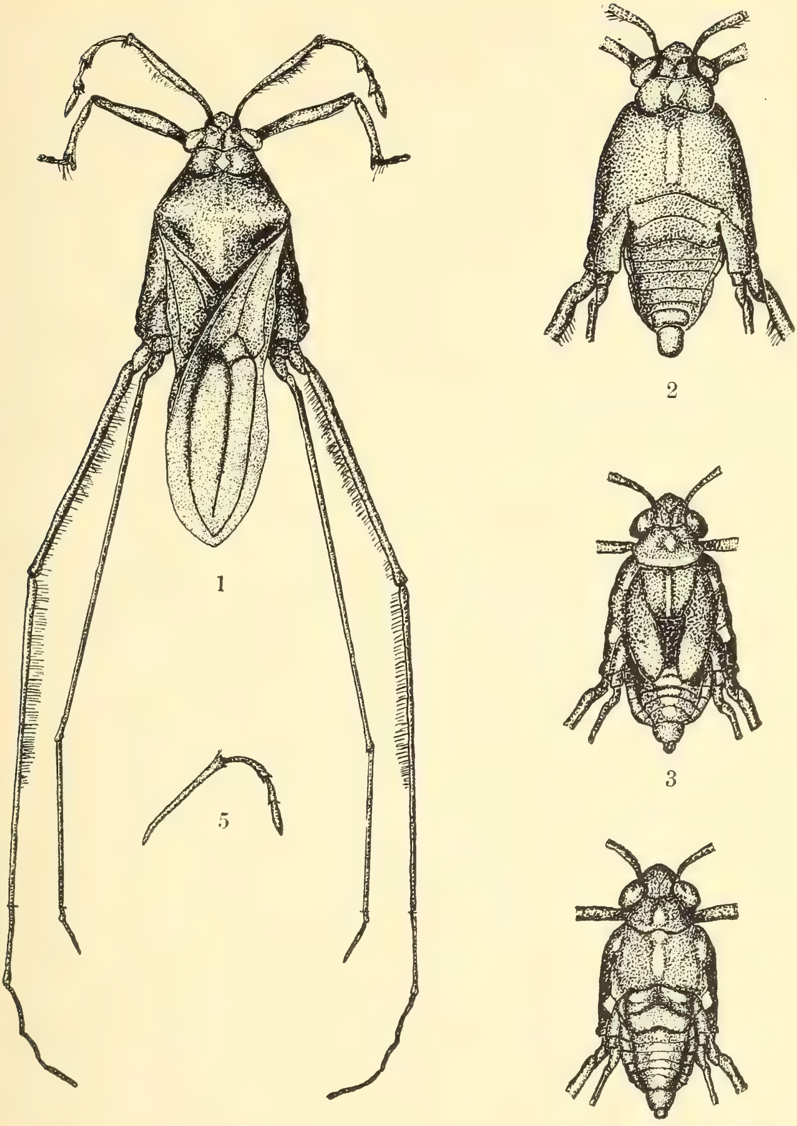
This extraordinary occurrence surely merits record, although there is no known explanation to be offered. The weather seemed ordinary, the ponds contained the usual amount of water, no special migration seemed imminent and none was observed. However, a favorable opportunity was afforded to make some study of the winged types, and so the figures on Plate XXI have been drawn in commemoration. While the primary purpose of these figures is to illustrate the rare winged form as adult and nymph (figs. 1 and 3), attention may be called here to several other points, some of which I hope to discuss more fully at another time.

The species exhibits a special degree of sexual dimorphism, wholly uncorrelated with the pterygopolymorphism. As will be seen in fig. 1, the male has thickened antennae, set with bristles, while the female (fig. 5) has slender antennae without the bristles. The mesothoracic legs of the male are likewise provided with a fringe, which is lacking in the female. The sexual difference in antennal shape can be faintly seen in the older nymphs.

In the winged forms the visible portion of the thorax, as seen from above, is all pronotum, composed of anterior and posterior lobes, while in the wingless adult (fig. 2) the largest segment of this region is the mesothorax. The detailed anatomy of adult and nymph is being worked out for later report.

The alate nymph (fig. 3) differs from the apterous (fig. 4) largely in the possession of wing-pads and in some correlated details of thoracic structure. The evident difference in outline is due largely to accidents of preservation, I think, although to judge from both dry and alcoholic material, there is a real differentiation in the shape of the thorax.

Both adults and nymphs are black or very deep brown in color, with some shading of lighter brown in places, and, in the adults,



METROBATES HESPERIUS Uhler
1 Alate adult ♂; 2 Apterous adult ♂; 3 Alate nymph; 4 Apterous nymph; 5 Antenna of adult ♀. x9—Parshley.

faint bluish areas of of variable development on thorax and abdomen, most noticeable in the apterous specimens. The nymphs have a bright yellow pattern, indicated in figs. 3 and 4 by white spots. Of this the adults retain only the small anterior yellow spot on the pronotum and, in the wingless form, a broad, faint bluish stripe on the mesonotum.

Only prolonged breeding experiments can determine the exact hereditary basis of the pterygopolymorphism exhibited by *M. hesperius* and similar species, but it seems reasonable to suppose that Mendelian factors, so distributed in the germplasm of the species as to produce special recombinations on occasion, might well be postulated as a working hypothesis. Of all the alate examples studied in this experience, none showed any signs of the broken hemielytra long since described in this subfamily by de la Torre-Bueno, although reproduction was in full swing.

AN OBSERVATION ON THE ETIOLOGY OF A CERTAIN MALFORMATION IN THE EARWIG, ANISOLABIS MARITIMA (GENE) (DERMAPTERA).

By Waro Nakahara and Dorothy Nakahara, Tokyo, Japan.

The occurrence of various malformations in insects is of common observation, but little seems to be known concerning their etiology. Some of the malformations are known to be congenital and hereditary, and several noteworthy types in *Drosophila* have been closely investigated by Morgan and his school. A great majority of the malformations recorded in entomological literature is of unknown etiology. Many larval and nymphal malformations have been referred to as being due to the supposed developmental disturbance (Entwicklungsstörung) in embryonic stage, but the nature of the disturbance is far from being understood. Apart from these, no small number of malformations assumed to be due to abnormal regeneration of the mutilated part of the body have been described.

In the course of our observation on the life history and habits of the earwig during the last summer and fall (1928) we had an opportunity to observe a case of the malformation of the forceps, which can be most conclusively attributed to the incomplete regeneration of the mutilated part. This we propose to report in the present note.

The earwig in question is a common species in Tokyo. We found it plentifully in our back yard, under flower pots, stones, etc. It goes under the name of *Anisolabis maritima* (Géné) in vernacular entomological handbooks, and we tentatively refer it to that species.

On August 23, a batch of eggs, some 50 in number, were collected along with the brooding female. The eggs were apparently fully mature, as they all began hatching the same day. The first molting took place during September 6 and 7, and the second one during September 15 and 16. All the 3rd instar specimens were normal at this time. On September 27 one specimen again molted, while others followed it one by one until on October 2 all but a single specimen were in the 4th instar.

This slow-growing 3rd instar specimen had lost the left half of its forceps sometime previously, presumably in a fight with its comrades. Fights are very frequent among young earwigs kept in a small space, and the forceps are freely used as weapons on such occasions. For fear that other earwigs might kill this specimen, now reduced in its fighting capacity, we isolated it into a separate jar, and kept careful watch on it. The specimen finally molted on October 11, and it was found that the mutilated half of the forceps had regenerated but only in half its natural size. It died on October 14 and was pickled in alcohol.

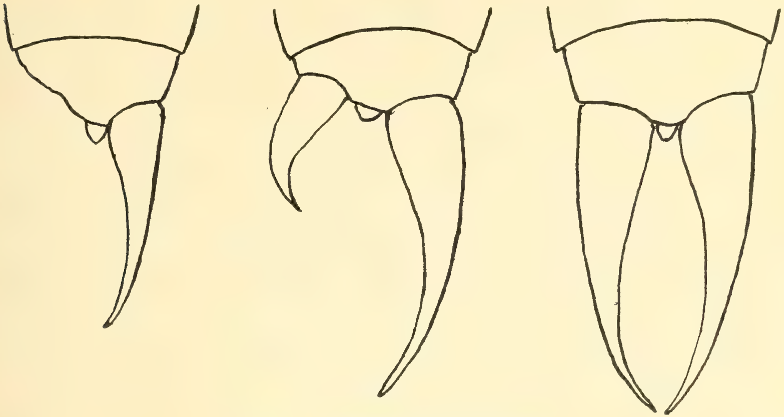
Figure 1, drawn from the cast skin saved at the time of molting, represents the state of mutilation. It will be seem that the entire left side of the forceps is cut off including the adjacent part of the last abdominal segment. The length of the intact side of the forceps is 2 mm.

Figure 2 is drawn from the alcoholic specimen above mentioned, and it illustrates the forceps after the molting. As may be seen from this figure, the regeneration of the mutilated parts was incomplete, and gave rise to an obvious malformation. The length of the normal side of the forceps is 2.5 mm., and that of the regenerated small side about 1 mm. The color of the regenerated side is pale yellow, not reddish brown as in the normal structure. The last abdominal segment is also deformed, and is shortened on the left side.

Normal forceps of a 4th instar earwig are shown in Figure 3 for comparison. The length of the forceps here is about 2.5 mm.

It is well known that a considerable individual variation occurs in the size and shape of the forceps in many species of earwigs, especially *Forficula auricularia* L. In *Anisolabis maritima,* however, the morphology of the forceps is remarkably stable, and apart from the constant sexual difference, the variation in the forceps seems to be very slight.

The life history and habits of *Anisolabis maritima* have been studied in America by Bennett (Psyche, Vol. XI, p. 41, 1904) and in Formosa by Takahashi (Zool. Magaz. Tokyo, Vol. XXXVIII, p. 412, 1926). Our observation, as far as it extended, confirms the statements of these authors, with a single exception, namely: our series of specimens show the antenna of the second instar to be 15 jointed, not 14 jointed as stated by Takahashi. Our observations on the use of the forceps concur entirely with the account given for *Anisolabis annulipes* by Pallister in this Bulletin, Vol. XXII, P, 254, 1927.



Explanation of Figures.

Figure 1. The mutilation of the left side of the forceps.

Figure 2. The forceps malformation due to the incomplete regeneration.

Figure 3. Normal forceps. All the figures are drawn to the scale, and are of the dorsal aspect.

LEPIDOPTEROLOGICAL CONTRIBUTIONS.

By William Barnes & Foster H. Benjamin, Decatur, Illinois.

When Mr. F. H. Benjamin recently visited the senior author at Decatur he pointed out that a considerable quantity of manuscript represented by changed names in the latter's collection, or by manuscript types, remained unpublished. It is, therefore, now published in order to balance the names in the collection with published work.

I.

Three New Species of Phalænidæ from the New Jersey Pine Barrens.

Feltia buchholzi sp. nov.

Frons with a slightly raised but not roughened projection. Antennae serrate and fasciculate. Palpi blackish laterally. Head rufous. Collar with a slight black band. Thorax and fore wing purplish gray slightly tinged with rufous and irrorated with black; basal line indistinct; t. a. line black, excurved in the submedian fold and below vein 1, claviform distinctly black outlined, more or less connected to base of wing by a slight black streak; orbicular ovate, pale, black outlined and with blackish center; reniform similar in coloration, short; a median diffuse black shade passes between the ordinary spots where it is intensified into a black cell filling, thence outwardly oblique to inner margin; t. p. line strongly dentate, bent outward below costa, excurved to about vein 4, then incurved; s. t. line represented by a faint blackish shade with only traces of any black dashes between the veins, which of themselves are more or less black marked; a narrow black terminal line; fringe pale at base with darker interline and dusky tips. Hind wing whitish, heavily tinged with fuscous, and appearing rather dark; no discal mark; fringes pale at base, with darker interline and dusky tips. Underside whitish, the fore wing, costal—outer margins and veins of hind wing so irrorated with fuscous as to appear quite dark; a dusky common band across all wings.

Expanse: 28 mm.

More like the western *gravis* than any other species known to us. Besides the eastern locality, the practical lack of an s. t. line, plus darker hind wing with lack of discal mark on upperside, should distinguish it. *Type locality:* Lakehurst, N. J.

Number and sexes of types: Holotype ♂, allotype ♀, Barnes Coll. Paratypes 2 ♂, Lemmer Coll.

?Epipsilia heinrichi sp. nov.

All tibiae spined, fore tarsi with rather longer spines than normal, the spines at the distal ends of the segments appearing almost claw-like. Head and thorax clothed with fine hair-like scales and rough hair, venation normal Agrotid, frons smooth and somewhat rounded out; palpi hairy below, dark at sides pale at tips. Frons pale; vertex, collar, and thorax concolorously dull purple brown; abdomen tinged with rufous. Fore wing purple, suffused with violaceous gray and rufous, and irrorated with black; basal line from costa to median vein narrow, black; t. a. line faintly double, inner part suffused, included space of ground color, outer part distinct, black, waved; claviform obsolescent; orbicular irregular, pale, outlined faintly by black, with a central filling of ground color; reniform irregular, mottled, tending to be inwardly extended along median vein, and with a black spot in its lower part; t. p. line oblique on costa, strongly excurved around cell, dentate on the veins; s. t. line pale, obsolescent, mesially marked by a blackish spot on costa; a faint terminal series of black spots between the veins. Hind wing fuscous, somewhat paler basally. Beneath: pale, sordid, irrorated with fuscous, with faint discal spots and common band. Expanse: 35 mm.

Type locality: Lakehurst, N. J. *Number and sexes of types:* Holotype ♀, "IV–26."

We know of no closely allied species. This insect will probably ultimately become the type of a new genus. It is a connecting link between "*Agrotis*" in the sense of Hampson and *Epipsilia,* besides possessing characters not possessed by typical species of either genus.

Graptolitha lemmeri sp. nov.

Allied to the European *Graptolitha lapidea*[1] to which it will run in Hampson's keys (1906, Cat. Lep. Phal. B. M., VI, 247, 249). Differs from the European species by the stronger nature of the markings, the t. a. and t. p. lines produced to

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[1] For the loan of this specimen, and many other courtesies including comparisons of various genotypes, we are indebted to Dr. William Schaus of the National Museum.

> longer and sharper points, more red at the base of the reniform, fore wing with costal and inner margins more nearly parallel, and all wings darker, the hind wings nearly evenly fuscous. Beneath the discal spots are much better marked, as are the lines on the tibiae. We have no male of *lapidea* available for dissection, but from a superficial examination of the male genitalia of a single specimen of the European species which was loaned to us, the structure termed ampulla by Pierce extends nearly as far caudad as the valve tip, making the valve look almost bifurcate, while *lemmeri* has the same structure much smaller and blunter. There is a large amount of difference in the valves, those of *lapidea* more evenly drawn out and narrower than those of the new species. A single specimen of the species has long been in the Barnes Collection and was labeled by Dr. McDunnough, "This is possibly *lapidea* Hbn. from Europe."

The most closely allied North American species appears to be *longior* Sm., from which *lemmeri* differs by being about 5 mm. greater in expanse, fore wing with the costa and inner margin more nearly parallel, possessing a more purplish cast and more contrasting maculation. Expanse 42 mm.

Type localities and number and sexes of types: Holotype ♂, Nov. 16; Allotype ♂, Nov. 14, in Barnes Coll. 22 Paratypes, Nov. 7–22; all of the above taken by Mr. Frederick Lemmer, at Lakehurst, N. J. 1 ♂ Paratype, Ivoryton, Conn., X–14. 8 Paratypes in Barnes Coll., balance in Lemmer Coll.

II.

GENERIC NOTES (PHALÆNIDÆ)

Eviridemas gen. nov.

Type *Viridemas minuta* B. & McD.

Proboscis aborted, minute, scarcely visible; palpi aborted, not as long as the width of the eye, roughly clothed with hair and hair-like scales; frons narrow, less than the width of the eye, not bulging but rather depressed in the vicinity of the eyes, very slightly roughened, with a very slight horizontal ridge below the middle because the ventral part is strongly bent inward, a slight corneous plate below it; eyes large, round, naked, unciliated save for a few white hairs from behind; ocelli present; antennae of male peculiar, appearing slightly pectinate, in reality with the under side of each joint drawn out into a strong lamellation, from each disto-lateral

> angle of these lamellations there arises a strong serration or small pectination; a ridge of scales between bases of antennae; thorax clothed almost entirely with broad scales, a very few hairs and hair-like scales intermixed; (no trace of a prothoracic crest on four examples but a slight rubbing of some and improper pinning of others prohibits definite statement that a crest does not exist); patagia very short; metathorax with a mass of scales forming a large tuft rather than a crest; all tibiae unarmed, but fringed with very long hair and hair-like scales, the normal spurs not long but not very conspicuously shortened; tarsi not obviously modified, unarmed save for the usual spines which are rather small; abdomen practically uncrested, three or four scales at base tending to form a very slight crest; frenulum of male normal, single; retinaculum of male normal, not bar-shaped. Fore wing with the apex rounded, the termen rather obliquely curved and not crenulate, oblique enough to make the apex seem more acute than it really is; veins 3, 5 from near angle of cell; 6 from somewhat below upper angle; 9 from 10 anastomosing with 8 to form the areole which is not large; 7 from areole; 11 from cell. Hind wing with veins 3 from angle of cell; 4 from above angle; 5 obsolescent from slightly below middle of discocellulars; 6, 7 stalked from upper angle, the length of the stalk somewhat variable but (in four examples) not short; 8 anastomosing with cell near the base only.

We have given a rather lengthy description because the genus is a very peculiar one, including characters which will separate it from the Arctiidæ. It has little to do with *Viridemas* Sm., type *galena* Sm. That genus has the frons produced to a strong and rather pointed prominence with the point connected to the vertex by a strong ridge, it is also a much heavier insect agreeing with *minuta* mainly in the short tongue and a general lack of characters. The palpi are quite short, but not really aborted and so exceptionally short as in *miuta* which possesses the smallest palpi of any Phalænid we have studied. Our only specimen of *galena,* and which has been compared with the type, is too rubbed to be sure about the abdominal characters, but we suspect that fresh specimens will show a crest on the third abdominal segment, contrary to the original description. The eyes of *galena* are strongly ciliated from behind, and very likely also from in front, so that the genus *Viridemas* may ultimately go into the Cuculliinæ. We do not make this transfer, pending examination of fresh material.

Hemistilbia gen. nov.

Type *Stilbia apposita* B. & McD.

Proboscis fully developed; palpi rather short, upturned, when closely appressed the second joint nearly reaching the middle of the frons, moderately fringed with scales, the third joint short, porrect; frons smooth and scarcely bulging, with clypeal plate below it; eyes large round, naked; antennae simple, ciliated, in both sexes; thorax mainly clothed with broad scales, a few hairs intermixed; tegulae produced into a slight hood, the prothorax otherwise uncrested; metathorax with a large tuft-like crest; tibiae unarmed, the mid and hind tibiae moderately fringed with hair; abdomen without dorsal or lateral crests. Fore wing not broad, the apex rounded, the termen evenly curved and not crenulate; veins 3, 5 from near angle of cell; 6 from below upper angle; 9 from 10 anastomosing with 8 to form the areole, 7 variable, sometimes connate from areole with 8 and 9, sometimes stalked with 8 and 9; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 almost obsolete from somewhat below middle of discocellulars; 6 variable, sometimes stalked with 7, sometimes connate with 7 from upper angle, sometimes from slightly below upper angle; 8 anastomosing with cell for about one third the length.

The present genus is allied to the European genera of the *Stilbia* group, which have vein 7 of the hind wing fused with the cell for a considerable distance. The European *Stilbia anomala* Haw. (genotype of *Stilbia*) probably also varies in venation, contrary to recent European publications, as a specimen before us has veins 3 and 4 of the hind wing stalked, as well as 6 and 7.

Hemistilbia has shorter wings, less bulging frons, longer palpi, shorter areole, and vein 8 of the hind wing less fused with the cell, than in *Stilbia*.

Anycteola gen. nov.

Type *Stilbia fotelloides* B. & McD.

Proboscis fully developed, unscaled; palpi upturned, short, the second joint not reaching middle of frons, its vestiture compressed and of scales only, the third joint short, not porrect; frons smooth, not bulging, narrow, scarcely more than half the width of the eye, the usual clypeal plate not visible; ocelli present; eyes large, round, naked, unciliated; antennae

> simple, the shaft scarcely ciliated in both sexes, the scape with a peculiar fan-shaped tuft of spatulate hair-like scales resembling the eye-cap of certain Tineid genera (*Bucculatrix*, etc.); thorax clothed entirely with broad, and only slightly dentate, scales, save for a few fine hairs on the patagia; the prothorax without visible crest; patagia with tips upcurved forming a pseudo-crest, this being amplified by raised scales on the mesothorax forming a strong mesothoracic crest; a strong metathoracic crest in the form of a tuft; tibiae unarmed, the usual epiphysis on fore tibia, the mid tibia with the usual single pair of spurs and some hair; the hind tibia with the usual two pair of spurs and some hair, the distal spurs somewhat shorter than normal; abdomen with a slight dorsal crest at base only; frenulum simple in the male, triple in the female; retinaculum of male normal, not bar-shaped. Fore wing with the apex somewhat rounded, the termen quite obliquely curved, the normal transverse lines picked out by black raised scales; vein 3 from lower angle; 4 from well above angle; 5 from about one third below middle of discocellulars; 6 from well below upper angle; 7 variable, from the areole, or connate with the stem of 8 and 9 from the end of the areole; 9 from 10 anastomosing with 8 to form the areole which is rather small, the stem of 8 and 9 rather short; 11 free. Hind wing with veins 3, 4 from angle of cell; 5 practically obsolete from slightly below middle of discocellulars; 6, 7 rather long stalked from upper angle; 8 anastomosing with the cell for about one third the length, the base of vein 8 appearing to be individually variable but usually free.

The present genus is a very peculiar one. Aside from the nature of vein 8 of the hind wing and a general lack of many characters, *Anycteola* seems to have little to do with *Stilbia*. We think it belongs to the Phalænidæ ("Noctuidæ"), although it may be a queer offshoot of some Bombycid stem. In some respects it is rather like *Afrida* Moesch. which possesses a rather similar structure from the antennal scape. We suspect *Afrida* may be a peculiar Phalænid, lacking ocelli, and with bar-shaped retinaculum, as vein 8 of the hind wing does not fuse with the cell except toward the base. However because of lack of ocelli plus the bar shaped retinaculum we leave *Afrida* tentatively in the Lithosiinae. *Anycteola* possesses ocelli which would necessitate its placement in the Arctiinæ if an Arctiid. Here it would have to fall into the group with cubitus of the hind wing trifid and the fore wing with an areole. Few Arctiids possess such a venation, and those which have it appear to have a very long and narrow areole, also the bar-shaped retinaculum, and rather pointed wings. We cannot be absolutely certain that vein 5 of the hind wing is obsolescent. Possibly what we consider vein 5 is only a fold, and it may be that veins 3 and 4 have completely fused and that 5 is in reality from the lower angle of the cell. Such a condition takes place in some of the "Sarrothripinæ," and some species of that subfamily have a very similar habitus to *Anycteola,* as may be judged from the name. They also agree in possessing raised scales on the wings. But they disagree by possessing a bar-shaped retinaculum in the males, similar to the Arctiidæ.

Phœnicophanta Hamp.

Type *Phœnicophanta flavifera* Hamp.

1910, Hampson, Cat. Lep. Phal. B. M., X, 653, *flavifera* sole species and designated type.

This is a very peculiar genus which might well be placed with some of the aberrant Apatelinæ ("Acronyctinæ") rather than in the Acontiinæ ("Erastriinæ").[2] Hampson's diagnosis conveys rather a wrong impression. The proboscis is short, but nearly twice the length of the head. The frons is strongly produced, rather truncate, and appears armed with a number of minute spine-like granulations. There appears to be a slight clypeal plate closely appressed to the frontal prominence. Vein 5 of the hind wing is from close to the middle of the discocellulars and very obsolescent. Veins 6 and 7 appear stalked from the upper angle of the cell and not connate, although this may be a variable character. The fore wings differ in the two sexes. There is a fold above vein 6, as illustrated by Hampson, in both sexes, and this fold appears much like vein 7. We cannot be sure if the missing vein is 9 or 7. On the female wing there are three radials on a stalk. Vein 11 is from the cell. The male has a structure in the radials of the fore wing resembling a fovea, and this appears to be bounded above and below by tubular veins. From the costal side of this, near its distal end, arises a single unbranched vein, and from the distal end the stem of a stalked bifurcate vein. Hampson's drawing shows a dip in the radial sector, which corresponds to the anal edge of the fovea-like structure, and the edge which is much thickened, but the drawing does not show the normal tubular vein along the costal edge of the structure. This fovea-like organ certainly looks much like a modified areole. If it is a modified areole perhaps the fold above vein 6 really represents vein 7, which would be the missing vein instead of 9.

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[2] Those workers who wish to reject the Hübnerian Tentamen names *Apatela* and *Erastria* (1806); to adopt the names *Acronicta* Ochs. (1816), or *Acronycta* Treit. (1825), *Erastria* Ochs. (1816) or Treit. (1826); and hence to use the family names "Acronyctinæ" (recte Acronictinæ) and Erastriinæ; find themselves confronted with a peculiar puzzle of nomenclature. See B. & Benj., Bull. B'klyn Ent. Soc., XXI, p. 183. Since this latter was written (1926), Dr. W. T. M. Forbes informed us of a published "Prospectus" by Hübner on file in the library of Cornell University which actually offers for sale the Hübnerian plate of **Erastria** *immista* **Dissimilaria** (Samml. exot. Schmett., pl. CCIII). This prospectus is dated 1814, and even with the rejection of the Tentamen would make *Erastria* Hbn. a monotypic generic name in the Geometridæ. There is also an indication that certain American species of the Zütrage, including *Triæna tritona* Hbn., were published by 1814, *Triæna* thus having priority over *Acronicta* and *Acronycta.*

The North American *Phœnicophanta bicolor* B. & McD. is so identical in structure with the Argentine *P. flavifera* Hamp., and both organisms are so very peculiar, that were it not for the widely different localities we might be inclined to consider that only race of a single species were involved.

Afotella B. & Benj.

Type *Hadena cylindrica* Grt.

1025, Barnes & Benjamin, Bull. B'klyn Ent. Soc., XX, 195, *cylindrica* sole species and designated type.

We regret to say that in our diagnosis of the genus, which is *Fotella* of Hampson but not of Grote, we overlooked the fact that the eyes are hairy as in *Trichocosmia*.

The genus falls in Hampson's keys to the Hadeninæ between *Nephelistis* and *Odontestra*, but obviously related to neither of these. It is close to *Trichocosmia* Grt., but possesses a prothoracic crest. It must be close to the true *Namangana* Staud.,[3] but we are now unable to make a direct comparison. As we recall, *cretacea*, the genotype of *Namangana*, the frons was somewhat bulged, but not so strongly, nor was it roughened, which is why Hampson described the frons as smooth and flattened. Also on the only *cretacea* we ever saw, a cotype, we could find no prothoracic crest. The specimen was, however, somewhat rubbed, so we are not sure of the thoracic tuftings.

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[3] See 1926, B. & Benj., Pan Pac. Ent., III, 64–65.

Hadenella Grt.

Type *Hadenella pergentilis* Grt.

1883, Grote, *Pap.*, III, 123, *pergentilis* sole species and therefore type.

1895, Grote, Abh. Nat. Ver. Bremen, XIV, 81, type designated *pergentilis.*

1909, Hampson, Cat. Lep. Phal. B. M., VIII, 231, type designated *pergentilis.*

Has hairy eyes and belongs in the Hadeninæ. The peculiar frons completely separates it from any other genus known to us in this subfamily. It appears rather closely related to *Afotella,* so we place it following that genus.

Phalaeninae.

There are a number of genera and species placed by Hampson, (1903, Cat. Lep. Phal. B. M., IV) and authors in the subfamily "Agrotinæ" (recte Phalæninæ); and by Warren (1911, in Seitz, Macrolep., III), considered Heliothids. These organisms possess reniform shaped eyes; mid, hind, and often fore tibiae armed with spines, but without claws.

The European *Oxytripia orbiculosa* Esp. seems to have no real allies in North America. Neither does the Tibetan *Grumia flora* Alph. Another group, possibly representing three distinct genera, is the one termed *Ala* by Hampson and *Anartomorpha* by Warren. This group differs from our North American organisms by having the fore tibiae unspined and at the same time having decidedly hairy eyes.

The genus Hampson calls *"Agrotiphila"* is divisible into four distinct genera.

Schöyenia Auriv., type *arctica* Auriv., the species presumably a synonymy of *unifasciata* Ménétr., appears distinct by its compressed venation; small areole; 7, 8 and 9 stalked on the fore wing; 6 and 7 stalked on the hind wing; in conjunction with spined fore tibiae; hairy vestiture; serrate male antennae; and the usual obsolescent vein 5 of the hind wing.

Barrovia B. & McD. has similar tibial armature, and rather similar venation, but is at once distinct by the strong vein 5 of the hind wing which is only obsolescent toward the discal cell, by the peculiarly bipectinate-lamellate male antennae, broader wings, and general Geometriform habitus. The fore tibiae are spined, contrary to the original description. *Barrovia* seems rather out of place as a member of the Phalænidæ, but we know of no better placement.

Archanarta gen. nov.

Type *Noctua quieta* Hbn.

"Noctua" quieta Hbn. has been placed by Hampson in his *"Agrotiphila" (Schöyenia)*, and by Warren in *Schöyenia.* It has usually been placed in *Anarta.* The habitus is decidedly that of an *Anarta;* the wings are broad; and the eyes are distinctly hairy, although the hair is rather short, and somewhat difficult to see because of the long cilia overhanging the eyes. All tibiae are spined. The vestiture is of hair only. The venation is entirely normal in three specimens before us, the only stalking of veins being the usual one of 8 and 9 on the fore wing.

Epipsiliamorpha gen. nov.

Type *Agrotis alaskæ* Grt.

"Agrotis" alaskæ Grt. has been placed by Hampson in his *"Agrotiphila"* proper, on the strength of the male antennae not being serrate. We possessed a single male example from St. Paul's Island, Alaska; and recently have acquired two fine pair through the kindness of Mr. E. P. VanDuzee, the locality also St. Paul's Island. The thoracic vestiture is of hair only. All tibiae are spined. The habitus is decidedly like an *Epipsilia,* the male with normal Epipsilia-like wing shape, the female with the wings aborted and narrow. The venation is the same in both sexes, except that because of the aborted wings, the veins in the female wings are often rather waved. The venation of the fore wing is normal; 6 and 7 of the hind wing are stalked. The eyes are reniform shaped and obsolescently hairy, the hair sparse and rather difficult to see. Contrary to Hampson, the male antennae are very heavily serrate, almost bipectinate; and the palpi are long and exceed the frons.

Agrotimorpha gen. nov.

Type *Agrotis staudgineri* Moesch.

The fourth group in Hampson's *"Agrotiphila"* is the one he considers typical, citing *staudingeri* as type, the citation presumably intended for *montana* Morr. which he places in the synonymy, and which is the type of *Agrotiphila* Grt. Hampson's *staudingeri* is not true *staudingeri* but is probably *colorado* Sm. In his addenda, Hampson removes *montana* from the synonymy of his *staudingeri* and puts it into *Orosagrotis* Hamp. with priority over *rigida* Sm. This is probably because of information furnished by Smith, who published on *montana* Morr., 1903, Trans. Am. Ent. Soc., XXIX, 204. Smith is correct in that Morrison described the Colorado species later named *rigida* by Smith, and his description cannot possibly apply to *staudingeri* or *colorado.* Smith is probably incorrect in associating the so-called type of *montana* in the Tepper Collection with *staudingeri,* as we have only seen the latter from Labrador. If the Tepper Collection specimen is from Colorado, Morrison's type locality, it is probably some other species.

Grote's description of *Agrotiphila* is rather poor, as it omits mention of the frons. It is not unlikely that he may have described the genus from a specimen of *colorado* erroneously determined as *montana,* but he makes *montana* sole species and therefore genotype of *Agrotiphila. Orosagrotis* Hamp., therefore, falls into the synonymy of *Agrotiphila* Grt., its type being *rigida* Sm.

The bulk of the species placed by Hampson in his *"Agrotiphila"* proper; i.e., *staudingeri, maculata,* and *colorado,* are typical "Agrotid" in habitus, have no more in common with the Heliothids than do other Agrotids; all the tibiae are spined; the vestiture is mixed, scales, hair-like scales, and hair; eyes reniform, and we can see no hair on them; the venation variable individually and not specifically, the fore wing sometimes with 7 shortly stalked with 8 and 9, the hind wing sometimes with 6 and 7 stalked. The male antennae are beaded and ciliated, but vary with the species.

These species are rather closely allied to those of the genus Hampson calls *Orosagrotis* (recte *Agrotiphila*), but lack the truncate frontal prominence.

Agrotiphila Grt., type *montana* Morr., (*Orosagrotis* Hamp., type ≠ *rigida* Sm. nec Wlk. = *montana* Morr.) has reniform shaped eyes, not visibly hairy; vestiture mixed, hair, hair-like scales, and scales; a truncate conical frontal prominence; all tibiae spined; the venation seems less variable than in *colorado-staudingeri,* 6 and 7 of the hind wings stalked in all specimens examined of both *montana* and *incognita,* but 7 of the fore wing is variable individually, sometimes stalked with 8 and 9 and sometimes not stalked.

Parabarrovia Gibson, type *Parabarrovia keelei* Gibson, is known to us only through the literature (1920, Rept. Can. Arct. Exped., III, (1), 33). Gibson states that the fore tibiae are unspined, and veins 3 and 4 of the hind wings are stalked; characters which make a rather unique genus. The habitus seems somewhat similar to *Barrovia,* and we suspect little real relationship to the normal "Agrotid" type.

We give a key to the genera discussed.

PHALAENIDAE WITH SPINED TIBIAE AND RENIFORM SHAPED EYES.

I. All tibiae spined

A. Frons with truncate conical prominence. . . . *Agrotiphila* (= *Orosagrotis*)

B. Frons without truncate conical prominence

a. Thoracic vestiture of hair only;

a¹. Vein 5 of hind wing strong, only obsolescent near cell; wing shape Geometriform; areole short; 7 stalked with 8 and 9 on fore wing; 6 and 7 stalked on hind wing; eyes naked *Barrovia*

b¹. Not so; 5 of hind wing obsolescent; habitus not Geometriform; eyes naked or hairy

a². Habitus Anarta-like; wing shape normal, broad, in both sexes; without stalked veins except the usual stalking of 8 and 9 on fore wing; eyes decidedly hairy; male antennae serrate .... *Archanarta*

b². Habitus Epipsilia-like; wing shape of male normal but not broad; of female aborted; venation normal except for stalking of 6 and 7 on hind wing; eyes obsolescently hairy; male antennae heavily serrate, *Epipsiliamorpha*

(? eyes naked)

c². Wings very narrow; venation compressed; areole small; 7 stalked with 8 and 9 on fore wing; 6 and 7 stalked on hind wing; male antennae serrate .... *Schöyenia*

d^2. Wings with apex rectangular; venation normal except 6 and 7 stalked on hind wing; male antennae bipectinate. . . . . *Grumia*

b. Thoracis vestiture mixed: hair, hair-like scales and scales

Habitus normal Agrotid; venation variable; fore wing with 7 sometimes stalked with 8 and 9, sometimes not; 6 and 7 of hind wings sometimes stalked; variation individual only; male antennae beaded and ciliated, *Agrotimorpha*

II. Fore tibiae unspined

A. Eyes decidedly hairy . . . . { *Anartomorpha*, *Ala*, *Trichanarta* }

B. Eyes naked (or hair not easily visible)

a. Head and thorax clothed with hair only and without crests; 3 and 4 of hind wing stalked; habitus somewhat Geometriform . . . . *Parabarrovia*

b. Head and thorax clothed with scales; with a small prothoracic and a large metathoracic crest; habitus of normal "Noctuid". . . . . *Oxytripia*

This arrangement of genera and species leaves *kyune* Barnes without placement. The species was described as a *Hadena* (1904, Can. Ent., XXXVI, 168) and later placed by Barnes and McDunnough in *Agrotiphila* [1911, Contrib., I, (4), 16; and, 1917, Check List, No. 1224]. The unique type, a female, has only part of one leg, fortunately a fore leg. The fore tibiae are spined, without claws. The palpi are moderate in length. The eyes are large and rounded, precluding association with *Agrotiphila*. The thorax is too rubbed to be sure of tuftings, but the thoracic vestiture seems rather mixed, but mostly of broad scales. The abdomen appears probably untufted. The venation is normal except that 6 and 7 of the hind wings are stalked. The frons is quite strongly bulged, altho lacking a truncate conical prominence. This bulging frons occurs in several "Agrotid" genera, the whole of the Phalæninæ needing generic revision. We tentatively place *kyune* after *capota,* which has a similar frons, in *Rhizagrotis.*

Trichosilia Hamp.

Type *Noctua acarnea* Sm.

1918, Hampson, Nov. Zool., XXV, 112, *acarnea* sole species and designated type.

Proboscis fully developed; palpi obliquely upturned, reaching beyond middle of frons, the second joint fringed with long hair, the third joint short; frons slightly roughened, rather bulging, and with small clypeal plate below it; eyes large, round, hairy, overhung by long cilia; antennae of male slightly serrate, and fasciculate; thorax clothed with scales, hair-like scales, and hair, with a spreading prothoracic crest tending to form a double keel to the metathorax which has loose hair from both sides tending to form a dorsal tuft; all tibiae spined and fringed with hair; abdomen not flattened, with considerable rough hair especially basally, and with lateral tufts of rough hair and scales terminally, but without distinct dorsal crests. Fore wing broad, with the apex rounded, the termen rather evenly curved; veins 3 and 5 from near angle of cell; 6 from below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from the cell. Hind wing with veins 3, 4 from near angle of cell; 5 obsolescent from somewhat below middle of discocellulars, 6 and 7 long stalked from upper angle; 8 anastomosing with cell near base only.

Hampson's diagnosis being faulty in some respects, we have redescribed the genus.

Trichofeltia gen. nov.

Type *Agrotis circumdata* Grt.

Proboscis fully developed; palpi obliquely upturned, reachabove middle of frons, the second joint fringed with long hair in front, somewhat shorter than usual, and the third joint proportionately longer; frons smooth, not bulging, and with only a trace of a clypeal plate below it; eyes large, round, very hairy, overhung by long cilia from behind, and shorter cilia from in front and from the bases of the antennae; antennae of male strongly bipectinate; thorax clothed with hair and hair-like scales only and without distinct crests, the metathorax with rough hair from both sides tending to form a tuft; mid and hind tibiae spined; fore tibia with only a single spine which is on the outer side near the metatarsus; all tibiae moderately fringed with hair; abdomen dorsally flattened, with some rough hair especially basally, but without distinct dorsal crests. Fore wing narrow, the apex rounded, the termen rather evenly curved, and not crenulate; veins 3 and 5 from near angle of cell; 6 from slightly below upper angle; 9 from 10 anastomosing with 8 to form the areole, 7 shortly stalked with 8 and 9 in most specimens, sometimes appearing practically connate; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from somewhat below middle of discocellulars; 6 and 7 shortly stalked from upper angle; 8 anastomosing with cell near base only.

For those interested in genitalic differences between genera, we might mention that there seems little in common between *Trichosilia* and *Trichofeltia.*

III.

Specific Notes (Phalænidæ).

Triphæna Ochs.

Type *Phalæna pronuba* L.

Triphæna plebeia race **bajoides** nov.

Similar to typical *plebeia,* but much smoother in general appearance, the ground color darker, the ordinary spots not strongly disconcolorous.

While *plebeia* was described from Vancouver Island, British Columbia, and California, the single Californian type is a female from unknown locality. The name should be restricted to the Vancouver Island form as the description fits this in every detail.

Forty specimens are before us, all much alike, and all very contrasty. A single example from Shasta Retreat, California, seems like the Vancouver specimens.

Specimens from Hunters, Washington, are strongly marked, but the ground color seems somewhat darker than in the Vancouver examples. A single specimen from Como Park, Colorado, agrees with the Washington examples.

Material from Vineyard and Provo, Utah, seems variable, one example nearly agreeing with the Washington lot, and varying from this to duller forms.

Both the dull and brightly marked forms are found at Yosemite, California, but Plumas Co. material before us seems all to be the dull form. The least contrasting of the specimens considerably resemble smooth *baja.*

We are restricting our types to the Plumas Co. specimens and selecting as Holotype a very unicolorous specimen.

Type locality: Plumas Co., Calif. *Number and sexes of types:* Holotype ♂, 8–15 Aug.; Allotype ♀, 8–15 Aug.; 3 ♂, 4 ♀, Paratypes 1–7 and 8–15 Aug.

Triphæna hospitalis Grt.

Smith, 1898, Jour. N. Y. Ent. Soc., VI, 100, pl. VII, f. 9, figures the male genitalia in contrast to those of *jucunda,* pl. VII, f. 4. These drawings by Smith are very poor. The Barnes Collection possesses a specimen determined as *hospitalis* and this lacks a valve. Smith was the only one known to us to deliberately so mutilate specimens. The example is simply labeled "New York" and is likely the specimen from that locality mentioned by Smith. We see little to distinguish the specimen from true *jucunda* except that the claviform is somewhat longer. In reality the genitalia of both this example and typical *jucunda* seem about half way between Smith's two figures. We strongly suspect that our single *"hospitalis"* is only a freak of *jucunda.* The actual type of *hospitalis* in Collection Hill should be reexamined to determined what the name really represents. Hampson, without North American specimens and presumably upon the strength of Smith's remarks, sinks the name to the European *brunnea* D. & S.

Triphæna esurialis race **uclueleti** nov.

> Similar to typical *esurialis,* forewings bright luteous slightly tinged with rufous, the markings tending to be washed out; no basal black filling between or before the stigmata. Hind wings as in the typical form but tinged, like fore wings, with luteous-rufous.

Type locality: Ucluelet, B. C. *Number and sexes of types:* Holotype, 24–VII–09; 1 Paratype, 27–VII–09, the paratype bearing an additional label, C. H. Young, Ottawa.

"Ceramica" vindemialis Gn.

This name has been omitted from recent North American lists because Hampson, (1905, Cat. Lep. Phal. B. M., V, 445, pl. XCI, f. 2) states that the type while labeled Florida will probably prove to be from New Zealand. We have an example exactly agreeing with Hampson's figure of the type, and from Florida. Tentatively we place this in *Barathra* Hbn., type *Noctua albicolon* Sepp (= *Trichoclea* Grt.)

Perigrapha Led.

We are inclined to place the bulk of the species put by Hampson in *Perigrapha,* along with those placed by him in *Monima,* in

Graphiphora Hbn. A specimen compared with the type of *prima* Sm., and agreeing fairly well although not exactly, has very strongly lashed eyes and will fall into *Stretchia*. In habitus, also, *prima* agrees with *inferior* Sm. and *plusiaeformis* Hy. Edw., this latter species the genotype of *Stretchia*.

We have a long series of the *pulchella* group of *Graphiphora* and all intergrades between *pulchella* Harv., *addenda* Sm., *palomarensis* Hill, and *hepatica* B. & McD. We now consider that these names represent only maculation forms of an exceptionally variable species. One other name, *orbiculata* Sm., (1911, Jour. N. Y. Ent. Soc., XIX, 147) has been omitted from the Check List, presumably because Smith states for *pulchella* that he "came near" redescribing it as "*orbiculata* from a type in which the orbicular is unusually contrasty," but this certainly publishes the name and description. It can also stand as a form of *pulchella*. The name *achsha* Dyar may stand as a race of *pulchella*, and *algula* Sm. as a color form of this race, pending further material.

The so-called *Perigrapha pectinata* Sm. appears to be conspecific with *Perigonica punctilinea* Sm. Pending further material we save the latter name, tentatively, as a race, placing both names as a single species in *Perigonica*.

Morrisonia mucens Hbn.

We seem to possess all intergrades between *Morrisonia mucens* Hbn. and *sectilis* Gn., so that we consider the latter name represents only a maculation form.

Embolœcia sauzalitæ form **papaipemoides** nov.

Entirely similar to the typical form except for the lack of white filling to the stigmata.

Type localities and number and sexes of types: Holotype ♂, "California," "135," presumably originally a Henry Edwards specimen; Allotype ♀, San Francisco, Calif., Sept. 1, '00, F. X. Williams; 1 ♂ Paratype, San Francisco, Calif., ex Cirsium.

Types in: Holotype and Allotype in Barnes Collection, Paratype in Collection Bird.

Papaipema inquaesita form **wyatti** nov.

Similar to the typical form, but the orbicular and claviform marked with white, the reniform marked with some white especially costally.

Type locality: St. Therese Isl., St. Johns Co., Quebec, IX–15.
Number and sexes of types: Holotype ♂, (G. Chagnon), unique.

Notes: Messrs. Wyatt and Beer of Chicago, Illinois, have reared a series of intermediates.

Apatela oblinita form *insolita* Grt.

1873, Grote, Bull. Buff. Soc. Nat. Sci., I, 82, *Acronycta.*

Much has been written regarding the identity of this "species." Mr. Tams has kindly examined the type for us in comparison with both *lanceolaria* and *oblinita,* and reports; *"Eulonche insolita* Grote is unquestionably a melanic *oblinita."* The type came from Pennsylvania. We have seen two melanic *oblinita* from Oak Station, Pa., from Mr. Fred. Marloff, who kindly deposited one in the Barnes Collection.

Elaphria Hbn.

Type *Elaphria grata* Hbn.

1818?, Hubner, Zütr. exot. Schmett., I, 16, No. 36, ff. 71–72, *grata* sole species and therefore type.[4]

This generic name has priority over *Monodes* Gn. as used in the Barnes & McDunnough Check List and in Hampson, Cat. Lep. Phal. B. M., VIII.

Elaphria ensina Barnes

1907, Barnes, Can. Ent., XXXIX, 12, *Oligia.*
1917, Barnes & McDunnough, Check List, No. 2610, *Monodes.*
obliquirena Hamp.
1918, Hampson, Nov. Zool., XXV, 151, *Calymniodes.*

Specimens agreeing with the types of *ensina* were submitted to Mr. Tams of the British Museum who labeled them *Calymniodes obliquirena,* "comp. type," "exact." We are indebted to Prof. Draudt for first suggesting the possibility of this synonymy.

Micrathetis triplex Wlk.

1857, Walker, Cat. Lep. Het. B. M., XI, 721, *Laphygma.*
1909, Hampson, Cat. Lep. Phal. B. M., VIII, 443, f. 123, *minuscula* B. & McD. *Micrathetis.*

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[4] Since this page was written we have been informed by Dr. W. T. M. Forbes that this species was probably published not later than 1814.

1913, Barnes & McDunnough, Contrib., II, (1), 6, pl. II, f. 12, *Athetis.*

1913, Barnes & McDunnough, Contrib., II, (3), 115, *Athetis.*

"Athetis" minuscula was first "described" (March 1913) by a figure. A description was subsequently published (April 1913), and the previously figured specimen indicated as the "cotype," the "type" not having the black filling to the reniform. Here is a problem in nomenclature. Is the originally published specimen the actual type, or is the type which remained in manuscript until a month later the true type? However, it is not our purpose to go further than the actual taxonomy involved, and to call attention to the specific synonymy. Regardless which "type" be selected to hold the name, *minuscula* is only a minor color or maculation form of *triplex.* In this regard, *benjamini* Draudt (in Seitz) is also the same species. We base this statement upon paratypes given the Barnes Collection by Professor Draudt, these being various forms and practically covering the range of variation of the species. With additional names applied by Professor Strand to abs. 1 and 3 of Hampson, and with the number of names at present listed in the synonymy (see Hampson, 1909), those who may wish to apply names to minor forms have a remarkable puzzle of nomenclature coupled with the necessity of careful comparison with actual types.

Charadra deridens Gn.

1852, Guénée, Spec., Gen., V, Noct., I, 35, pl. III, f. 8, *nigrosuffusa* Strd. *Diphtera.*

1913, Hampson, Cat. Lep. Phal. B. M., XIII, 374, *deridens* ab. 1, *Charadra.*

1916, Strand, Archiv. fur Naturgesch., A, 2, 46, *deridens* ab., *Charadra.*

Charadra circulifera Wlk.

1857, Walker, Cat. Lep. Het. B. M., XI, 709, *Acronycta. contigua* Wlk.

1865, Walker, Cat. Lep. Het. B. M., XXXII, 446, *Charadra. sudena* Smith.

1908, Smith, Jour. N. Y. Ent. Soc., XVI, 80, *Charadra.*

A considerable number of specimens of *Charadra* were submitted to Mr. Tams for comparison with the types and series in the British Museum. The names *circulifera* and *contigua* appear to be applicable to the southern form or species subsequently named *sudena* by Smith. The name *nigrosuffusa* Strd. appears to be simply the northern species or form now going in all collections as *deridens* Gn. The type of *deridens* is not in the Barnes Collection, and according to Mr. Tams is not in the British Museum. Until other evidence is offered we would consider the name *deridens* applicable to the northern form or species with *nigrosuffusa* as a synonym; and *circulifera* applicable for the southern form or species with synonyms *contigua* and *sudena.* The exact status of *circulifera* is difficult to state. It is very possibly only a Gulf Strip race of *deridens.* Tentatively we allow two species following Smith and Barnes & McDunnough.

Catocala euphemia Beut.

1907, Beutenmuller, Bull. A. M. N. H., XXIII, 938, *Catocala.*
1913, Hampson, Cat. Lep. Phal. B. M., XII, 41 (ignot.), *Catobapta.* ╪ *neogama* Auct. nec A. & S.
1884, Hulst, Bull. Bklyn Ent. Soc., VII, 51 (partim), *Catocala.*
1893, Smith, Bull. U. S. N. M., XLIV, 349 (partim), *Catocala.*
arizonæ Strd.
1913, Hampson, Cat. Lep. Phal. B. M., XII, 41 (as *neogama* ab. 3), *Catobapta.*
1914, Strand, Archiv für Naturgesch., 79, A, 8, 64, *neogama* ab., *Catobapta.*
1922, McDunnough, Can. Ent., LIV, 101, *euphemia, Catocala.*

In an effort to have specimens compared with the types of the Strand names in the British Museum we submitted an example of *euphemia* to Mr. Tams, who informed us that the Museum possessed no Arizona material. It is to be noted that Hampson listed Arizona for *neogama* but did not list the specimen as being in the Museum. He does, however, cite Smith, 1893, who in turn cites Hulst, 1884. Hulst, under heading *neogama* states, "The specimens from Arizona have the marginal border of the hind wing broken." Hampson's description for his ab. 3 reads, "hind wing with the terminal band interrupted." We strongly suspect that in reality Strand's description is based upon examples of *euphemia* misdetermined as variants of *neogama* by Hulst, 1884.

In relation to these Strand names, we have an example compared with the type of *subnatana* Strd. This is the normal male of *subnata,* not normal female as suggested by Dr. McDunnough (1922, Can. Ent., LIV, 101).

IV.

CORRECTION OF A GENERIC HOMONYM (PHALÆNIDÆ).

Eubuchholzia nom. nov.
Type *Arsilonche colorada* Sm.
ǂ *Buchholzia* B. & Benj. Syn.
Type *Arsilonche colorada* Sm.

We are informed by Messrs. Embrik Strand, Theodore Frison, and R. C. Williams, Jr., that the name *Buchholzia* is preoccupied.

V.

NOTES ON THYATIRIDÆ.

Habrosyne gloriosa Gn.

Guénée, 1852, Spéc. Gén., V, 12, put into print the Boisduval manuscript name *gloriosa* as being based upon a European specimen of *scripta* (*abrasa*). We have been unable to locate the type of *gloriosa.* No European worker with whom we have corresponded recognizes the name, and all agree that the locality given by Guénée is presumably in error unless by chance a single specimen might have been introduced as a pupa or larva and the resulting adult captured.[5]

The description is, however, good; and points out the identical differences between *scripta* (*abrasa*) and *gloriosa* that exist between *scripta* and *rectangulata* Ottol. This, coupled with the fact that Boisduval and Guénée obtained considerable quantities of material from Canada, New York, etc., lead us to consider that the heretofore unplaced name *gloriosa* is a prior name for *rectangulata.*

Habrosyne scripta race **abrasoides** nov.

Colors less contrasty than in typical *scripta,* the s. t. whitish shade reduced in width, the reniform more elongate. A parallel to *gloriosa* (*rectangulata*) race *arizonensis* B. & McD.

Type locality: Redington, Ariz. *Number and sexes of types.* Holotype ♀, unique.

The synonymy of the species of *Habrosyne* Hbn. found in America north of the Rio Grande is as follows:

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[5] Della Torre, in Wagner, Lepid. Cat., 1921, pars 25, p. 5, lists *gloriosa* from "Kaukasien" but cites no references other than Guénée and Walker.

scripta (*Gosse*)
  abrasa (Gn.)
a abrasoides *B. & Benj.*
chatfeldii *Grt.*
  ╪ *derasa* (Auct.) (nec L.)

gloriosa (*Gn.*) (*Bdv. ms.*)
  rectangulata (Ottol.)
  ╪ *rectangula* B. & McD.
    (lapsus calami)
a arizonensis *B. & McD.*

VI.

SPECIFIC HOMONYMS (PHALÆNIDÆ).

"*Polia*" *olivacea* (Morr.), described in *Mamestra*, is a "secondary" homonym of "*Polia*" *olivacea* Steph. Under the present International Zoological Code there seems no differentiation between "primary" and "secondary" homonyms, and *olivacea* Morr. appears to be unavailable.

"*Polia*" *olivacea obscurior* Sm. was described when Smith considered many of the western *olivacea* races, which he subsequently named, as being typical *olivacea*. Although his description seems to restrict the type to a single specimen, he makes mention of other eastern material being the same. We have carefully compared the type of *olivacea* Morr. (Strecker Collection) with the type of the so-called variety *obscurior*, and consider that the type of the latter is simply the female of the former.

If secondary homonyms are to be rejected, the name *obscurior* Sm. would appear available for the species now known as *olivacea*.

"*Polia*" *stricta kappa* B. & Benj. seems preoccupied by *Noctua cappa* Hbn., placed by Hampson in *Polia*, under the rules that specific and subspecific names have the same status as far as nomenclature is concerned, and that $c = k$. We propose the anagram **papka** nom. nov. for *kappa* B. & Benj. nec *cappa* Hbn.

VII.

NEW GEOMETRIDÆ (LEPID.).

Enypia venata form **eddyi** nov.

Markings similar to British Columbia *venata*, but with the primaries so heavily suffused with fuscous that with the wings folded the insect appears almost a melanic. Some of the white ground color shows through the fuscous suffusion mesad of the intradiscal and distad of the extradiscal lines. Secondaries only slightly darker than those of the typical form. The present described form is practically the opposite of form *elaborata* C. & S.

Type localities and number and sexes of types: Holotype ♂, Friday Harbor, Wash., Aug. 2, 1924; 6 ♂ Paratypes, Friday Harbor, Wash., Victoria and Duncans, B. C., July and August.

Notes: the British Columbia specimens mostly from A. W. Hanham; the Washington specimens from Samuel Eddy.

Hulstina aridata sp. nov.

> Much like *formosata* in size and maculation, but at once easily differentiated by the practical lack of brownish shadings. Genitalia of male not unlike *formosata* in general but differing in many details, especially in the sacculus. Expanse 32 mm.

Type locality: Mohave Co., Ariz. *Number and sexes of types:* Holotype ♂, April; 19 ♂ Paratypes May 1–7; presumably collected by O. C. Poling.

Note: the Barnes Collection possesses other specimens from Clark Co., Nev.

UNDESCRIBED SPECIES OF THE GENUS LIMNOPHILA FROM EASTERN NORTH AMERICA.

(Tipulidae, Diptera).

PART IV.

BY CHARLES P. ALEXANDER, Amherst, Mass.[1]

The species of *Limnophila* discussed at this time are based chiefly on collections made by the writer in New York and New England. Additional material was collected by my friends, Messrs. Notman, Rogers and Walley, to whom I express my sincere thanks for this opportunity of studying the contained novelties.

Limnophila Macquart

Prolimnophila n. subgen.

> Antennae with the verticils elongate, much exceeding the segments. Head not narrowed behind. Tuberculate pits vestigial, placed on the extreme cephalic margin of the praescutum. Pseudosutural foveae inconspicuous. Wings with the anterior arculus lacking or barely evident; R_{2+3+4} in alignment with *Rs* and nearly equalling it in length; R_{2+3} angulated at origin; cell *1st* M_2 very elongate, its inner end strongly arcuated and lying proximad of the other elements of the cord; *m-cu* beyond midlength of the cell.

Type of subgenus.—*Limnophila areolata* Osten Sacken (Nearctic Region).

Limnophila areolata is a common crane-fly in Northeastern North America, being especially characteristic of hemlock-yellow birch forests in June. The character of a broken arculus reminds one strongly of *Pseudolimnophila* and it may be that the present group is more correctly placed with that genus. The most conspicuous venational feature is the very large, arcuated cell *1st* M_2.

Limnophila (*Prionolabis*) **walleyi** n. sp.

Male.—Length 6.5–7.5 mm.; wing 7–8 mm.

In its small size and general appearance, resembling *L.*

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[1] Contribution from the Department of Entomology, Massachusetts Agricultural College.

(*P.*) *simplex* Alexander, but in the structure of the male hypopygium more like *L.* (*P.*) *rufibasis* Osten Sacken.

Mesonotal praescutum without dark stripes, the color being blackish, dusted with yellowish gray. Femora yellow, the tips narrowly but distinctly infuscated; tibiae yellow, the tips narrowly blackened; tarsi brown, the tips of the segments darker, the outer segments uniformly blackened. In the paratype, the femoral tips are more gradually darkened. Wings with a grayish yellow ground-color; stigma small but well-defined; seams along the cord and outer end of cell *1st* M_2 narrow and inconspicuous; no heavy brown seam along vein *Cu* in cell *M.* Male hypopygium with the outer dististyle only weakly pectinate, the teeth small and variable. Inner dististyle bifid, the caudal or outer arm broader, densely set with microscopic appressed black teeth; cephalic or inner arm narrower, blackened, with a few weak erect setae. Gonapophyses appearing as flattened blades that are slightly dilated beyond midlength, the apex narrowed and produced into a long spine.

The right wing of the paratype has a weak adventitious crossvein in cell R_3 just distad of vein R_2.

Habitat: Northeastern North America.

Holotype: ♂, Brookview, Rensselaer Co., New York, June 15, 1923, (*Alexander*). *Paratype:* ♂, Bothwell, Ontario, May 23, 1925, (*G. S. Walley*). Type in the author's collection; paratype in the Canadian National Collection.

This interesting *Limnophila* is named in honor of Mr. G. S. Walley, who has added greatly to our knowledge of the Tipulidae of Ontario and Quebec.

Limnophila (*Phylidorea*) **siouana** n. sp.

Male.—Length about 6–6.5 mm.; wing 5.8–6.5 mm.
Female.—Length about 6.5 mm.; wing about 6.7 mm.

Closely allied and generally similar to *L.* (*P.*) *novæ-angliæ* Alexander, differing especially in the structure of the male hypopygium.

Antennae (♂) elongate, as in *novæ-angliæ,* if bent backward extending to opposite or beyond the base of the abdomen; scape obscure yellow; flagellum dark brown, the bases of the proximal segments narrowly pale. Head light gray, the occipital region more yellowish. Mesonotum shiny ferruginous, without distinct markings, the pleura more yellowish. Legs yellow, the femoral and tibial tips narrowly darkened; tarsi chiefly black, the proximal ends of the basitarsi obscure yellow. Wings uniformly pale yellow, the stigmal region only slightly darker; veins still darker yellow. Venation: *Rs* angulated at origin; cell M_1 shorter than or subequal to its petiole; *m-cu* at near midlength of cell *1st* M_2. Abdomen ferruginous yellow, in the male the subterminal segments blackened to produce a conspicuous ring; hypopygium ferruginous. In the female, the abdomen is more uniform in color. Male hypopygium generally as in *novæ-angliæ* in the setiferous median lobe on the caudal margin of the tergite and the general structure of the dististyles, differing very notably in the structure of the aedeagus and gonapophyses. Aedeagus a large, highly compressed blade, much as in *platyphallus* Alexander and others, the gonapophyses correspondingly elongated. In *novæ-angliæ,* the aedeagus is almost linear, showing only the beginnings of compression on the distal half; gonapophyses relatively small, hook-like.

Habitat: Iowa.

Holotype: ♂, Grinnell, Poweshiek Co., May 28, 1920 (*J. S. Rogers*); Collector's No. 38. *Allotopotype,* ♀; Collector's No. 40. *Paratopotypes,* ♂ ♀, with the type. Specimens in the Alexander and Rogers Collections.

Limnophila siouana has been standing in my collection as *L. novæ-angliæ* Alexander, to which it bears a notable general resemblance, differing conspicuously in the phallosomic structures.

Limnophila (*Ephelia*) **sabrina** n. sp.

Male.—Length about 5.5 mm.; wing 5.6 x 1.7 to 6.8 x 1.8 mm.

Female.—Length about 6.5 mm.; wing 7.5 x 1.8 mm.

Rostrum and palpi brownish black. Antennae relatively elongate, especially in the male, where, if bent backward, it extends some distance beyond the wing-base; scapal segments black, the flagellar segments dark brown; all flagellar segments elongate, the basal three or four more enlarged.

Praescutum yellowish gray, with three poorly indicated brown stripes, the median stripe weakly divided. Legs with the femoral tips conspicuously blackened; bases and tips of tibiae narrowly blackened. Wings narrow in both sexes, as shown by the above measurements, the entire central third of the wing being of approximate equal width; wing-pattern relatively sparse, about as in *aprilina,* with the last dark cloud at the end of vein *2nd A.*

Abdominal segments obscure brownish yellow, the caudal margins broadly dark brown, the lateral margins more narrowly so; outer segments more uniformly darkened. Male hypopygium generally as in *aprilina,* the outer dististyle with a large lateral flange on the basal half; spinulae of the style relatively weak, the apical spine small. Inner dististyle rather conspicuously widened, without a setiferous tubercle as in *irene.* Outer apical angle of the basistyle not produced and provided with long yellow setae as is the case in *irene.*

Habitat: Northeastern North America.

Holotype: ♂, Stowe, Lamoille Co., Vermont, June 29, 1927 (*Alexander*). *Allotopotype,* ♀, June 14, 1927. *Paratopotypes,* 5 ♂ ♀, with the allotype; *paratypes,* ♂, Amherst, Massachusetts, June 5, 1924 (*Alexander*); ♂, Keene Valley, Essex Co., New York, May 26, 1920 (*H. Notman*). Types in the author's collection.

Allied to L. (*E.*) *aprilina* Osten Sacken and *L.* (*E.*) *irene* Alexander, differing especially in the more elongate antennae in both sexes. From *aprilina,* it differs furthermore in the narrow wings of both sexes and the uniformly darkened antennae, agreeing in the general structure of the male hypopygium. From *irene,* it differs in the elongate antennae and structure of the male hypopygium, agreeing in the narrow wings of both sexes.

Limnophila (*Dicranophragma*) **angustula** n. sp.

Male.—Length about 4.5–5.5 mm.; wing 4.8 x 1.6 to 7 x 2.2 mm.

Female.—Length about 5–6 mm.; 5–6 mm.

Allied and generally similar to *L.* (*D.*) *fuscovaria* Osten Sacken, differing especially in the narrow wings of both sexes. In *fuscovaria,* the wings of the male are unusually broad, widest opposite the level of the termination of vein *2nd A.* In *angustula,* in both sexes, the wings are more uniformly narrowed, being only slightly wider opposite the anal vein than elsewhere along the middle third of the wing, the condition being about as in the females of *fuscovaria.*

Habitat: Northeastern North America.

Holotype: ♂, Amherst, Massachusetts, altitude 275 feet, July 25, 1928 (*Alexander*). *Allotopotype,* ♀, July 15, 1928 (*Alexander*). *Paratopotypes,* 15 ♂ ♀; *paratypes,* ♂ ♀, Orono, Maine, July 8, 1913 (*Alexander*); Mt. Desert, Maine, August 29–September 1, 1926 (*Alexander*); Woodworth's Lake, Fulton Co., New York, July 7, 1916 (*Alexander*); Cincinnatus, New York, July 20, 1916 (*Alexander*); Ithaca, New York, August 12, 1910 (*Alexander*). Type in the Alexander Collection.

This species has been confused in collections with *fuscovaria.* The latter species is especially characteristic of Canadian woodland conditions (yellow birch and beech, with hemlock) in June and early July. *L. angustula* is a summer species, on the wing from early July into September. Mr. Edwards has collected specimens of this species while in America in 1928 and considers the species to be distinct.

TWO MOTHS.

By William Eisenhardt, Flatbush, Brooklyn, N. Y.

Argema mittrei

This "Giant-Tailed Moth of Madagascar" is the largest and prettiest representative of the genus *Argema.*

For almost 20 years no fresh specimens have been caught and therefore this moth was considered to be extinct. Lately, however, a few fresh specimens have been caught again and I was fortunate to receive a set of them.

In Arthur Twidle's book "Beautiful Butterflies of the Tropics," the author says under the heading of

"The Most Wonderful Moth in the World":

"If we turn to Plate VI we shall find that the first thing to arrest the attention is the remarkable form of the great moth with the long-tailed wings, *Argema Mittrei.* The specimen from which the drawing was made was the second of its kind to reach Europe. It was taken by a missionary, one of that great army of pioneers working in far-away Farafangana in S. E. Madagascar.

"It came into the present writer's possession through an agent in London to whom it had been consigned. Some years ago the author took this moth to Dr. Alfred Russel Wallace at Broadstone, as he had expressed a wish to see it. Dr. Wallace spoke of it as 'the most wonderful moth in the world.' When the editor of 'Marvels of the Universe' required an outstanding marvel of Entomology, this moth was suggested to him and it figured in that work as such."

Argema mittrei is a silk-bearing moth and when found first it was tried to breed it for commercial purpose, but without avail.

Actias dubernandi

In Seitz Work vol. II, p. 211, this moth is the first one of the palaearctic Saturnidae. On account of the small, strange form of the wings and also of its dimorphism—male pink, female green—this moth is considered the prettiest and most interesting representative of the palaearctic Lepidoptera fauna.

Father Dubernand, the first one to find them, caught two males and one female in West China, and these three specimens found their way into the collection of Oberthür and were sold afterwards in England.

There are very few of this rare species in existence, and on account of the present political trouble in China, it is hard to say when we will be able to get any more.

PROCEEDINGS OF THE SOCIETY.

MEETING OF NOVEMBER 15, 1928.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening November 15, 1928, at 8.15 p. m.

President Davis in the chair and the following members present: Messrs. Bueno, Chapin, Engelhardt, Hunter, Nelson, Notman, Schaeffer, Sheridan, Siepman, Wallis, and two visitors.

In absence of the Secretary, Mr. Schaeffer acted as Secretary pro tem.

Dr. J. P. H. Marker, P. O. Box 121 Times Plaza Station, Brooklyn, N. Y., was proposed to membership by Mr. Engelhardt and being present was duly elected.

Mr. Hunter was reinstated as active member of the Society.

Mr. Bueno said that for the time this summer he found *Metrobates hesperius* in White Plains, Westchester Co., N. Y. Its most southern occurrence heretofore noted by him was in Putnam Co. (Lake Mahopac) where it is most abundant in company with *Trepobates pictus* and *Rheumatobates ribleyi.*

Mr. Davis announced the death of Dr. E. A. Schwarz, Washington, D. C., on October 15 and Mr. Engelhardt offered the following resolution to be published in our minutes which was accepted:

"The Brooklyn Entomological Society hereby expresses its deep-felt sorrow at the loss of its Honorary Member Dr. E. A. Schwarz, respected and loved by all who were privileged to know and to meet him during his long life devoted unsparingly to the cause and to workers in Entomology."

Mr. Engelhardt exhibited specimens of the European moth *Stilpnotia salicis* L. including one male collected by Mr. Pollard at Harrison, Maine, in July, and two females bred by Mr. Engelhardt from pupae collected at Vancouver, B. C., in July. A note regarding the occurrence of this injurious insect in North America has been submitted.

Mr. Bueno announced the death of our Honorary Member Wm. H. Nichols, Jr., a benefactor of the Society and Mr. Bueno was empowered to express the sentiments of the Society to his relatives.

"A Day with John D. Ritchie at Earl Grey, Saskatchewan," was the subject of a short paper by Mr. Engelhardt.

Mr. Ritchie a native of Ontario and an enthusiastic entomologist, moved into Saskatchewan several years ago to take up wheat farming. His place is seven miles from Earl Grey, a small settlement connected by railroad with the county seat, Regina, forty miles away. But trains do not connect on Sundays and a hired auto had to serve instead. After a pleasant sojourn in the Canadian Rockies the vast and flat country of Saskatchewan certainly appeared monotonous as observed from a train window, yet on close acquaintance it is found to be not lacking in diversity and interest. Wides stretches of wheat fields alternate with extensive swamps, ponds, lakes and occasional rivers which have cut deep valleys for themselves, supporting fairly good timber in an otherwise treeless country. The ponds and lakes fairly teem with water fowl of all sorts. A fox, a coyote and many rabbits crossed the road, muskrat houses could be seen all along the swamp margins.

A collection of insects fairly representative of the region and assembled by Mr. Ritchie at spare moments in the busy life on a wheat farm, indicated a fauna quite northern and in part arctic. Among the Lepidoptera there were specimens of *Apocheima rachelae,* that early spring geometrid of the far north, also Hepialidae and many Noctuidae that appeared unusual. Mr. Engelhardt's interest, however, were concerned chiefly with the Aegeriidae or clear-winged moths, of which there were a number of specimens, including a fine series of *Albuna pyramidalis.* This is a common species ranging across the continent from East to West but its food plant and habits were not known. Only one record based on a specimen recently received for determination and reported to have been bred by Mrs. Hippisley, of Terrace, B. C., from Fireweed, *Epilobium augustifolium,* served a clue for another investigation. A dense growth of this plant nearby revealed several pupal shells protruding from the soil, but none of the plants showed signs of boring larvae until with pick and shovel some of the main roots, eight to ten inches below the ground, had been exposed. Here a number of larvae were found, but more had left their galleries, tunnelled toward the surface and pupated in silk-lined tubes, one to two inches long. Thus the mystery of a life history which has baffled all efforts for many years, finally was solved.

Mr. Engelhardt exhibited a series of the clear-winged moth *Albuna pyrimidalis* showing its geographical races and variations and a root cutting showing the work of the larva.

Mr. Davis then spoke on the Fourth International Congress of Entomologists held at Cornell University, Ithaca, August 12, and following days. He mentioned the visit of twenty of the foreign Entomologists to the Staten Island Museum where tea was served, also the field excursion on the Island which was highly appreciated by those who participated. He showed a number of photographs taken at the Staten Island Museum and at Ithaca and explained them briefly. He also showed an enlarged group picture of the American and foreign delegates taken at Ithaca and a box of insects collected during his stay at Ithaca, representing two species of Cicadas and one Diapheromera femorata.

Mr. Bueno as acting secretary of the joint meeting of the Brooklyn and New York Entomological Societies held at the American Museum of Natural History on August 10, 1928, at 8.15 p. m. in honor of the foreign Entomologists visiting the United States for the International Congress of Entomology read the following minutes of the joint meeting:

MINUTES.

Minutes of a Joint Meeting of the Brooklyn and the New York Entomological Societies, held at the American Museum of Natural History on Friday, August 10, 1928, at 8.15 p. m. in honor of the foreign entomologists visiting the United States for the International Congress of Entomology.

In the chair, Dr. Frank E. Lutz, chairman of the Committee on Arrangements of the two Societies, assisted by Mr. William T. Davis, President, Brooklyn Entomological Society, and Mr. Henry Bird, President New York Entomological Society. Mr. Charles Leng, Secretary of the New York Society and Mr. J. R. de la Torre-Bueno, Vice President of the Brooklyn Society, acted as joint secretaries of the meeting.

Among the thirty visitors were Dr. Waterston, Mr. Prout, Mr. Collin, President of the Entomological Society of London; M. R. Jeannel, President of the Société Entomologique de France, M. Regnier, Prof. Silvestri, Dr. E. L. Bouvier; Dr. E. P. Felt, not a visitor but member of N. Y. Entomological Society; M. St. Claire Deville, Dr. Karl Jordan, Dr. W. G. Holland, Dr. Ceballos, Dr. Bolivar, Dr. Ball, of Belgium; Dr. Efflatoun Bey, of Egypt; Dr. Muir, of Hawaii; and among the members of the Brooklyn Society were Messrs. Olsen, Engelhardt, Bromley and Chapin; and many others, to the number of 30 visitors and members of the Societies.

Mr. Bird, of the N. Y. Society, extended a warm welcome as cordial as sincere, to the visiting entomologists.

Mr. Davis of the Brooklyn Society, expressed welcome and appreciation of this great visit. He also noted that our ancestors had paid but little attention to insects, deeming them too trifling to merit the attention of men, until their ravages made men take notice, whence has come the great advance in our science.

Mr. Collin, on behalf of the Fellows of the Entomological Society of London, extended cordial greetings to the Brooklyn and New York Societies. He felt quite overcome at the hospitalities they had received and would keep happy memories of New York. He said emphatically that entomological relations must become more international in character.

Dr. E. L. Bouvier, of the Paris Museum, then spoke in graceful French. He said he might say things already said by other speakers, but they were necessary to state, although all those from Europe would have the same to say. Two things he had to say—the first, that it was absolutely necessary that there should be contacts between European and American men of Science; and the second that thanks to the men of science of America, to those in the Museum of Natural History and to the members of both societies, these contacts were being rapidly and cordially established. He said that due to his unfamiliarity with English, he had not been able to properly express his gratitude to Dr. Lutz for his labors in behalf of the foreigners. The only way the French have to express and show appreciation is by exclamations of admiration, which barely express their feelings. He was happy at the accident (of the functionless bus) which showed them how fine Dr. Lutz was. And what an opportunity these delays afforded all to see our American fauna, the flora and the beauties of the American landscape. He would end this piecemeal talk by again expressing his thanks to the Entomological Societies and to the Director of the Museum.

Dr. Ball, speaking for Belgium, said he was very glad his first Congress was in the United States, with which there were so many ties of friendship. He had heard of the many wonderful things in this country; and his expectations had not been disappointed. In Belgium, science had been having bad times since the war; and the improved condition of the Belgian institutions of learning was due to American help. He expressed his appreciation of their reception here; and particularly to Dr. Lutz for so kindly conducting them and for his consideration. He also wished to think Mr. Davis for the collecting trip on Staten Island, where he had caught interesting insects.

Dr. Ignacio Bolivar, of the Madrid Museum, said, in English, that he expressed his congratulations to American Entomology; and his appreciation of Dr. Lutz and Mr. Bueno for their great kindness. He extended to the Societies the compliments of the Spanish entomologists that had come for the Congress.

Prof. Silvestri, speaking for Italy, expressed in English his thanks to the Societies for the reception of the evening. He had had the great fortune to visit this country 20 years ago, so he was no stranger among us. He gave voice to his great admiration of the American Museum of Natural History, which could serve as a model for other countries. It also gave him great pleasure to meet personally many entomologists, who had heretofore been known only by their letters.

Dr. Efflatoun Bey, speaking for the Egyptian Government and for the Egyptian Entomological Society, gave thanks for the successful efforts of the American Societies to make smooth the way of the foreigners to Ithaca, and invited all to Egypt.

Mr. Muir, speaking for Hawaii, deemed himself a case of mimicry, because he was passing himself off for a foreigner, while as a fact, he was from a U. S. possession. The Hawaiian Islands he said are unique and well suited for the study of evolution, because the conditions of life there are so simple. He extended to all an invitation to visit Hawaii.

Dr. Lutz then spoke; and thanked the Societies for the privilege they had accorded him of representing them in company with Mr. Bueno. He had missed many things, but had hopes for another time when he would be in everything.

J. R. DE LA TORRE-BUENO,

Secretary for the Brooklyn Entomological Society.

Mr. Bueno as a Brooklyn member of the N. Y. reception committee of the foreign Entomologists said that he was present when the first party of the delegates, consisting of the English, French, Belgian and Spanish entomologists arrived on the Tuscania; and that he and Dr. Lutz assisted them in every way. He participated in the arranged outing to Bear Mountain and other places and spoke of the great delay caused by the breakdown of a bus, which accident, though aggravating to the members of the N. Y. committee, Dr. Lutz and Mr. Bueno, was apparently greatly enjoyed and welcomed by the foreign entomologists, which delays, as Dr. Bouvier expressed in his speech at the joint meeting of both Societies, afforded all the opportunity to see more closely our American fauna and flora and the beauties of the American landscape. After this about forty-five interesting pictures of groups of American and foreign entomologists were shown on the screen with comments and remarks by Mr. Davis. The pictures were taken and the slides loaned by Dr. Harry Knight.

Before adjournment Mr. Davis was authorized to extend to Dr. Knight the thanks of the Society for the loan of these interesting pictures.

C. SCHAEFFER,
Secretary pro tem.

MEETING OF DECEMBER 13, 1928.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening December 13, 1928, at 8.15 p. m.

President Davis in the chair and the following members present: Bueno, Engelhardt, Huntington, Lemmer, Marker, Notman, Schaeffer, Sever, Shoemaker, Siepman; also three visitors: Messrs. Bigelow and Pollard, and Dr. Stuart.

In the absence of the Secretary Mr. Schaeffer acted as Secretary pro tem.

The editor announced that the December number of the Bulletin is in press and said that it takes a little more time now than before. He also made an appeal for short or brief notes for the Bulletin and called attention to the shortage of papers for Entomologica Americana on orders outside of Heteroptera and Coleoptra.

Messrs. Sheridan, Shoemaker and Lemmer were appointed by the President to serve as nominating committee for 1929.

Mr. Shoemaker reported having taken a specimen of the bean beetle, *Epilachna corrupta* Muls. at Liberty Street, N. Y. Mr. Davis showed specimens of the brightly colored South American Cicada, *Hemisciera maculipennis* Lap., and read an account from Bates, "A Naturalist on the Amazon," on the abundance and habits of this insect on the River Amazon.

Mr. Engelhardt told of an observation regarding the nesting habits and behavior of a large colony of the predatory wasp, *Chlorion harrisi* Fernald, which he found on the premises of Mr. H. P. Parks, Apiculturist, during April, 1928, near San Antonio, Texas.

This colony was utilizing the tube-like leaves of a dead yucca as nesting sides and at that time was storing the very young nymphs of the spiny Katydid, *Rehnia spinosa.* A note covering this observation already has been submitted for publication in the December number of the Bulletin. Subsequent reports received from Mr. Parks show that with the advancing season the wasps resorted to spiders and in August and September to tree crickets as their prey. Yucca leaves forwarded to the Brooklyn Museum by Mr. Parks during October are loosely filled with soft, dry grasses to a length of fifteen to eighteen inches and between this packing, at regular intervals, are the wintering wasp larvae protected by a grayish cocoon, soft, yet strong in texture. Excepting tree crickets, no other insects could be identified with certainty among the fragmentary remains of prey. Two Hemiptera (*Anasa tristis* and *Perillus bioculatus*), one flea beetle (*Disonycha varicornis*), and one land snail had found suitable hibernating quarters within the yucca leaves.

This observation was followed by remarks on food and nesting habits of some Hymenoptera by several members.

Messrs. Pollard and Schaeffer showed some interesting or rare insects from the collection of the late A. C. Weeks which is now in the Brooklyn Museum. Both emphasized the fact that though Mr. Weeks had been an active and vigorous collector and had accumulated a great amount of material, there were relatively few interesting or rare species in the collection considering the number of years Mr. Weeks collected.

Among the Lepidoptera shown by Mr. Pollard were *Remigia marcida, Catocala serena, Plagio mimicus pityachrous* and possibly a new variety of *Morrisonia exicta* and others.

Mr. Schaeffer exhibited from the Weeks collection about twenty-six species belonging to different orders which represented either new or additional records to the lately published list of insects of New York State. Among the Diptera were one specimen of *Volucella obesa* Fab. from Fort Wadsworth, S. I., and two specimens of *Pterodontia flavipes* Say from Yaphank, L. I., July and August. Of Hymenoptera one specimen of *Trogus elegans* Cress, from Yaphank, L. I., September, and two specimens of *Trogus nubilipenne* Hald., Brooklyn, June. The Orthoptera were represented by two specimens of *Phylloscelis pulchellus* Uhl. from Aqueduct, L. I., August. The rest of the material exhibited were Coleoptera of which, as well as of the other orders, a list will be published in our Bulletin as soon as the material is more carefully worked up, together with additional records and corrections to the list of insects of N. Y. State but derived from other sources.

On motion, the Society then adjourned.

CHAS. SCHAEFFER,
Secretary pro tem.

BOOK NOTES.

A Handbook of the Dragonflies of North America. By James G. Needham and Hortense Butler Heywood, assisted by Specialists in Certain Groups. Charles C. Thomas, Springfield, Illinois, 1929, 386 pp., 149 illustrations, also a bibliography and index.

The preface states that the book is " for collectors of dragonflies and for students of their natural history. It aims to furnish a ready means of finding the names of our North American species, and to report some observations on their habits. It contains keys, and descriptions and figures. The keys are guides; the descriptions and figures are together diagnostic. Both adult and immature stages, so far as known, are included." The book is divided into two parts: Part I, General, devoted to the life, structure, habits, collecting and preservation of specimens, etc., and Part II, from page 51 on, devoted to a systematic consideration of species, with tables for the determination of adults and where possible, the nymphs as well. The specific descriptions are numbered from 1 to 360, which permits of a practical arrangement of the collection, except in some of the genera, as, for instance, *Argia*, where they are arranged alphabetically. The larger dragonflies or Anisoptera, from Nos. 1 to 245, are first considered, and then the damselflies or Zygoptera, from Nos. 246 to 360. While the *Catalogue of the Odonata of North America*, by Muttkowski, includes the species known at the time of its publication, the student will of course find the present handbook covering the species of the same area with its detailed descriptions and figures added very helpful. However, we regret that it will cost him $7.00 instead of $5.00.

We do not see how our North American ants could be adequately covered unless names are used that express the conditions, such as species, geographic races, varieties, etc., and while Odonata do not present these complications to the same degree, yet there are certainly some geographic races and evident varieties, so " binomials only " as used in the book, does not appear, in the opinion of the writer, to give as much information as might easily be told. Often practical and helpful common names have been introduced, such as " Black Wings " for *Agrion*, and " Ruby Spots " for *Hetaerina*. In the Damselflies, C. Frances Byers has contributed about 40 pages to the book, and so to a considerable extent is one of the authors.

As is generally the case in determining the species in any group the student of Odonata will make better progress if he has several books at hand; he should consult the Handbook and then check up with the other books. The Handbook corvers such a wide area, that with its practical arrangement, it quickly leads to the probable species in hand. Sometimes, however, an error may have occurred. We think, for instance, that on page 72 the figures referring to *Ophiogomphus occidentis* are those of *O. aspersus,* and those marked *aspersus* are *occidentis,* and on page 328 the figure for *pollutum* would seem to need correction. However, as has been stated, every student should have the Handbook, start with it on his dragonfly, and then check up with some of the papers covering the Odonata of his state or locality, of which Professor Needham himself has written some excellent ones for the Adirondacks. As dragonflies are such good fliers, they often have a wide range.—Wm. T. Davis.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of all Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
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Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

WE WISH to procure in exchange or on cash: *Parnassius of North-America,* with its varieties and aberrations, well labelled, spread or in papers (clodius, smitheus, eversmanni). Dr. Staudinger & A. Bang-Haas, Dresden-Blasewitz.

THE MUSEUM of the Brooklyn Institute has a few uncolored sets of the Calverly, Weidenmeyer and Edwards plates of North American Sphingidae for exchange or for sale at $5 per set. Address, Librarian, Brooklyn Museum, Eastern Parkway, Brooklyn, N. Y.

LEPIDOPTERA from the Mountains of Kentucky. Papilios and other var. of this section collected. Paper spec. of *Xylophanes tersa* and *Catopsilia eubule* on hand. Also Cocoons of the larger Saturnid moths. Ellis Chandlee, Barbourville, Ky.

BUTTERFLY COLLECTORS—Have you butterflies which look different in color or pattern from the average? (See advertisement). Please write. Jeane Gunder, Pasadena, Calif.

CHRYSOMELIDAE, CRYPTOCEPHALINI. Wish beetles of this group from all over world. Will exchange local Coleoptera or purchase for cash. Write me before shipping material. Paul N. Musgrave, 514 Mt. Vernon Ave., Fairmont, W. Va.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

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OF THE

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BULLETIN

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Vol. XXIV October, 1929 No. 4

THE GENERIC STATUS OF CATOPSILIA HÜBNER AND PHOEBIS HÜBNER, WITH A DISCUSSION OF THE RELATIONSHIPS OF THE SPECIES AND THE HOMOLOGIES OF THE MALE GENITALIA (LEPIDOPTERA, PIERIDAE).

By Alexander B. Klots, Ithaca, N. Y.

Introduction.
Description and Homologies of Male Genitalia.
Interrelations of Rhodocerine Genera.
Specific Structures, Relationships, etc. of *Catopsilia.*
Specific Structures, Relationships, etc. of *Phoebis.*
Summary.
Bibliography.
List of figures.
Addendum.

Introduction.

Various authors have, from time to time, attempted to place the New World species generally included in *Catopsilia* in a different genus or in different genera, depending upon the degree of "splitting" in which each author believed, or upon the thoroughness with which he did his work. However, in spite of this series of efforts, which dates from the time of Hübner, both Old and New World species are at present usually "lumped" together under *Catopsilia.*

The writer, after a careful study of the structures of the species involved, has reached the conclusion that not only are the New World species worthy of being in a separate genus but that the two genera thus formed are not even closely related. He therefore refers the New World species to *Phoebis* Hübner (1) of which genus *argante* Fabricius is the type.

In general the writer bases this assumption mainly upon a study of the male genitalia and the pupae of the various genera of the *Rhodocerini,* inasmuch as the venation shows too little variation to be of value in establishing generic relationships. Inasmuch as the genitalia of the *Pieridae* have been little studied with reference to their homologies, and as the nomenclature of the genitalia of the Lepidoptera is in a very bad mess, the writer deems it advisable to describe and discuss at some length the terms of which he makes use. In this work Eyer's excellent paper is of great help (2).

DESCRIPTION AND HOMOLOGIES OF MALE GENITALIA.

Vinculum (v). In the genera under consideration the vinculum forms a chitinized band which articulates with the 8th abdominal somite. Normally in the Lepidoptera the upper ends of the vinculum articulate with the lateral margins of the tegumen, but here these ends appear to have extended up and fused on the mid-dorsal line cephalad of the tegumen, so that the vinculum forms a ring which is closed at the top and whose lower ends fuse with the saccus. (See figs. 1, 2 and 10 C.)

Saccus (s). A number of writers have applied this term in different ways. The writer here uses it to apply to the sac which extends cephalad inside the abdomen from the ventral ends of the vinculum. In previous papers the writer followed Pierce (3) in using the term to apply to the ventral portion of the vinculum in fusion with the present saccus, and applied the term " cephalad extension of the saccus" to the structure which he here calls the saccus. A flap extends caudad from the saccus and articulates by a recurved membrane with the 8th sternite. (See figs. 1, 2 and 10 C.)

Tegumen (t.) In *Catopsilia, Anteos* and *Eurymus* the tegumen bears on the mid-dorsal line a short, caudad-extending lobe which the writer terms the "basal lobe of the tegumen" (b. l. t.). See fig's. 10–14. Each lateral margin of the tegumen is prolonged ventrad into a tapering arm (b. t.) to which articulates the dorsobasal angle of the harpe. (See figs. 2 and 10 C.)

Uncus (u.) The uncus articulates with the caudal margin of the tegumen and overhangs or lies between the dorsal margins of the harpes. It shows considerable variation in size and shape. In many cases the articulation with the tegumen is very difficult to see. (See figs. 2 and 10–14.)

Gnathos (gn.) The writer applies this term to a pair of rounded, rather heavily chitinized flaps which originate at about the base of the uncus and extend ventrad on each side of the anal tube. Inasmuch as the gnathos is typically a structure arising from the tegumen this structure may not represent the true gnathos at all. (See fig. 2.)

Rectum (r.) and *Anus* (a.) The anus opens beneath the tegumen and is connected with it and with the base of the uncus by a membrane. (See figs. 1 and 10 C.)

Transtilla? (tr?) Extending ventrad from the anus is a lightly chitinized fold of membrane which runs ventrad and cephalad to join the anellus. This may possibly represent a modification of the transtilla. At least it occupies the same position and serves relatively the same function. (See figs. 1 and 10 C.)

Anellus (an.) The anellus is here a paired cephalad fold surrounding, in part at least, the aedoeagus. It connects dorsally with the transtilla part at least, the aedoeagus. It connects dorsally with the transtilla and with the membranous inner layer of the harpe, and laterally and ventrally with the inner layer of the harpe. Ventrally it is supported by the juxta. (See figs. 1 and 10 C.)

Juxta (jux.) The juxta is here in the form of a bar which lies between and articulates with the closely opposed inner edges of the "ventral thickenings of the harpes" and whose caudal end gives out an arm which runs sharply cephalad, forks laterally and supports the paired lobes of the anellus. In *Phoebis* these arms support the ventral wall of the aedoeagus. (See figs. 1 and 10 C.)

Setiferous Pad (s. p.) In *P. trite* occurs this curious structure, which is also present in *P. eubule* in a very rudimentary state. It consists of a pair of flattened, rounded pads, bearing a number of strong setae on their caudal margins, which are located at the top of the anellus and connected with the ventral edge of the "dorsal thickening of the harpe" by a strongly chitinized fold. (See figs. 1 and 3 B.)

Harpe (h.) *and its Structures.* The harpe is a flattened sac, closed and more or less pointed caudad and broad and open cephalad. The outer wall is bounded basally by a strongly chitinized rod (b. h.). This is then connected with the vinculum by a membrane. The inner wall extends cephalad to join the "transtilla," aedoeagus and anellus. The inner wall is thickened from the margin inward, forming the "dorsal thickening of the harpe" (d. t. h.), the "distal thickening of the harpe" (dis. t. h.) and the "ventral thickening of the harpe" (v. t. h.). Each of these more heavily chitinized areas bears many fine setae, while the "mesal area of the harpe" (m. a. h.) is plain and membranous. In *Phoebis* along the inner edge of the distal thickening of the harpe the outer and inner walls are fused together and this line is heavily chitinized, forming the " bar " which serves as attachment for a strong muscle. There is some reason for suspecting that this "bar" is a remnant of the "clasper" as found in some other and more primitive genera of the *Pieridae* (*Euchloe, Anthocharis, Perrhybrids,* etc.) In *P. philea, thalestris* and *avellanada* a strong fold runs from the bar, or near it, to the anellus, marking the line of the above mentioned muscle. (See figs. 4 and 7.)

Dorsal lobe a (d. l. *a*) occurs in *Catopsilia* as a rounded setiferous sac, projecting from the dorsal margin of the harpe. In most species of *Phoebis* it is absent, occurring in *trite, orbis* and *avellanada* as a small rounded swelling on the inner face of the dorsal thickening. (See figs. 1, 6, 7 and 10–14.)

The *Dorsal Spine* (d. s.) is a quite heavily chitinized process arising on the dorsum of the harpe, distad of dorsal lobe *a*. In *Catopsilia* it is located near the distal end of the harpe. In *C. crocale, pomona, thauruma* and *florella* it is connected with the dorso-basal angle of the harpe by a chitinized strip running along the outer surface just below the dorsum. In *C. pyranthe* and *scylla* this chitinized strip is absent. In *Phoebis* the dorsal spine is located more proximally and shows great development in some species.

The *Inner Lobe* (i. l.) is absent in *Catopsilia* but occurs in all species of *Phoebis* except the *statira* group as a long sac arising from the junction of the dorsal and distal thickenings of the harpe. It bears strong spines which in *P. eubule* are flattened and bifurcate. (See figs. 1–9.) The inner lobe is probably homologous with the " clasper " of Pierce and the " harpe " of Gosse and later workers.

The *Distal Process* is short and rounded in *Catopsilia*. In *Phoebis* it shows great development, often being prolonged into a long spine with various dorsal toothing at the base.

The ventral thickening of the harpe is in *Catopsilia* swollen into a rounded setiferous sac which the writer terms "ventral lobe *a*." In *Phoebis* no trace of this occurs, but the ventral thickening bears stronger setae than the other areas of the harpe.

INTERRELATIONS OF RHODOCERINE GENERA.

There are evident in the *Rhodocerini* two main types of male genitalia. In one of these, as represented by *Catopsilia, Anteos* (7), *Meganostoma* and *Eurymus,* the *basal lobe of the tegumen* is present, there is a strongly chitinized ventral *basal prong of the penis,* the *penis* is strongly curved and heavily chitinized and often bears strong teeth or spines, the *anellus* is located at about the middle of the vinculum in lateral aspect, the *saccus* is short and thick, and the *harpe,* is short and broad with lobes and distal process usually rounded. In *Catopsilia* and *Eurymus* the pupa does not show swollen wing cases. The writer has had no opportunity of examining a pupa of *Anteos.* The *raised line* (7) runs into the cell in the vicinity of the base of Cu_2.

In the other group of genera, *Phoebis, Eurema, Gandaca, Teriocolias, Gonepteryx, Dercas, Nathalis, Leucidia* and *Kricogonia,* the *basal lobe of the tegumen* is absent, the *penis* is long, slender and simple and bears no *basal prong* or strong teeth, the *anellus* is generally located just above the *saccus,* the *saccus* is long and slender, and the *harpe* is often much longer than high due to the great development of the distal process and bears slender often pointed lobes rather than short, broad rounded ones. Of these genera the writer knows only the pupae of *Gonepteryx, Phoebis* and *Eurema* (New World), but in these the wing cases are considerably swollen, sometimes enormously so. The *raised line* in most cases runs distad of the cell, not cutting it at all and running up into the apex of the primary, altho in a few cases it cuts the cell above M_3 but never below Cu_1.

SPECIFIC STRUCTURES, RELATIONSHIPS, ETC., OF CATOPSILIA.

The genitalia show very few characters for the differentiation of species, if we consider the large number of species which have been erected. The writer therefore thinks that there are in reality very few valid species in the genus. At present a lack of adequate material prevents him from reaching any definite conclusion on this matter, but it seems that not more than five species can be held as at all distinct structurally. These are shown in the following key:

1. Penis with a long heavily chitinized prong, in addition to the basal prong, a third of the length from apex, which bears a heavily chitinized tooth at base and is bent to the right; end of basal prong of penis flattened and strongly bilobed.
thauruma, fig. 10

1. Shaft of penis bearing only small simple teeth; end of basal prong of penis simple.......................... 2
2. Basal lobe of tegumen absent; caudal margin of 8th abdominal tergite bilobed..........................*scylla,* fig. 12
2. Basal lobe of tegumen present; caudal margin of 8th abdominal tergite simple.......................... 3
3. Basal lobe of tegumen short, less than 1/3 the length of the uncus; no chitinized strip extending along outer surface of harpe just below dorsum from "dorsal spine" to dorsobasal angle..........................*pyranthe,* fig. 13
3. Basal lobe of tegumen longer, more than 1/3 the length of the uncus; chitinized strip as described above present...... 4
4. A spine arising from a pit on right side of penis near tip; tip of penis prolonged ventrally into a long thin spine; "dorsal spine" of harpe longer, simple.............*florella,* fig. 11
4. A number of very short curved teeth along distal half of penis; tip of penis not prolonged ventrally into a long thin spine; "dorsal spine" shorter, usually with one or two toothlike dorsal irregularities...........*crocale* & *pomona,* fig. 14

The species are for the most part rather variable and produce a multitude of local and seasonal forms. Probably *crocale* and *pomona* are conspecific, and it is very possible that *florella* is merely an African race of this same species. *Thauruma* may be a more distinct race of the same species from Madagascar, an island which seems to produce large numbers of distinct forms. The validity of *pyranthe* as a distinct species is also doubtful. *Scylla* is of course very distinct in all its many forms.

Specific Structures, Relationships, etc., of Phoebis.

The writer here makes no attempt at any synonomic work on *Phoebis,* inasmuch as Mr. F. Martin Brown is working on the genus from that angle and will probably do a far more complete job than the writer could. The problem here is therefore mainly one of homologizing the various structures and tracing the relationships of the species.

As opposed to *Catopsilia* the species of *Phoebis* show excellent specific characters in the male genitalia, even *philea* and *thalestris* and *argante* and *agarithe* being very distinct from each other.

In structures other than the harpe the species show little variation. The "setiferous pad" occurs only in *trite* and *eubule* and is very much reduced in the latter. In the structures of the harpe, however, there is a great deal of variation.

Dorsal lobe a is practically absent in the genus. In *trite, avellanada* and *orbis* (See figs. 1, 6 and 7) occurs a small setiferous swelling in the dorsal thickening of the harpe which may possibly represent a rudiment of this structure. It appears to possess no particular significance.

The *bar* of the harpe occurs in nearly the same place in all of the species, serving as a muscle attachment. As previously stated this may represent a remnant of the clasper. In *neocipris* and *rurina* there is a distinct fold in the distal thickening of the harpe just below the bar, and the bar itself is rather more lightly chitinized. This fold also occurs to a lesser degree in most of the other species.

The *inner lobe* is present in all species except those of the *statira* group. It is a hollow sac of varying shape arising from the junction of the dorsal and distal thickenings. In all species except *eubule* it bears strong pointed setae. In *eubule* the setae are flattened and bifurcate, suggestive of modified scales. In *trite* the inner lobe is turned dorsad and projects above the dorsal margin of the harpe. In all other species it is turned inwards and ventrad.

The *distal process* shows a great amount of variation, and furnishes excellent specific characters in most cases.

The *dorsal spine* shows great variation. In *trite* (fig. 2) it is absent or represented merely by a slight swelling. It appears to originate as a dorsad projecting lobe which shows two main lines of development. In one, represented by *eubule,* (fig. 3) it is broad and blunt. In the other it is sharp and heavily chitinized. At first, as in *philea, thalestris* and *avellanada* it is short (figs. 4 and 7). It then lengthens out, as in *neocypris, rurina, argante* and *agarithe* (figs. 5 and 8). In occasional specimens of *agarithe* it is found bent downward between the harpes. Then, as in *orbis,* (fig. 6) it becomes permanently curved downward between the harpes, and begins to develop chitinized teeth on a strongly chitinized base, coincident with the loss of the inner lobe. The writer has not had the opportunity of examining *godartiana* and *hartonia* but is assured by Mr. Brown that they are related to *orbis.* Then in *statira,* (fig. 9) *neleis, wallacei, boisduvalii* and *etiolata* the dorsal spine develops into a heavily chitinized structure, double at the base with the outer part large and expanded and bearing strong teeth. These later forms may all be conspecific.

Forbes' grouping of the species of *"Catopsilia"* (4) appears to be rather well substantiated by study of the genitalia, as is shown by the following key to the groups in which use is made of the characters which he cites together with genitalic characters:

KEY TO GROUPS OF PHOEBIS, MALES.

1. No hair pencils or sex patches present 2
1. Hair pencils or sex patches or both present 3
2. Mealy border abruptly narrowed below cell M_1 of primary, never invading discal cell; inner lobe of harpe present, bearing flattened furcate setae; dorsal spine of harpe simple, broad, blunt; distal process of harpe short, rounded, bifid; setiferous pad present, rudimentary ....*eubule* group
2. Mealy border wide and even, often invading discal cell of primary, ending abruptly on secondary near Cu_1; inner lobe of harpe absent; dorsal spine of harpe strongly chitinized, either long, slender and bent down between harpes or widely expanded and bearing teeth; distal process of harpe long, bearing teeth at base; setiferous pad absent...*statira* group
3. No hair pencils present, sex patches present on both wings. 4
3. Hair pencil present on R_s of secondary 5
4. Mealy border abruptly narrowed on primary below M_2 or M_3, then marginal from there down until below 2d A where it extends deeply toward base of wing along inner margin; inner lobe of harpe present................*philea* group
4. Mealy border of primary broad, even, not abruptly narrowed below M_2 or M_3; inner lobe of harpe absent..*statira* group
5. Secondary with a double sex patch riding on vein R; dorsal spine of harpe absent or very rudimentary; setiferous pad present, strongly developed..................*trite* group
5. Secondary with no sex patch; dorsal spine of harpe present, well developed; setiferous pad absent.................. 6
6. Mealy border all very narrow, especially on the secondary, not approaching the cell even on the costa, extended in on inner margin of primary; wings rounded; dorsal spine long and rather narrow at base.....................*argante* group
6. Mealy border very broad and even in width; secondary tailed at anal angle; dorsal spine long, broad at base. *neocipris* group

Between the *argante* group and the *neocipris* group it is exceedingly difficult to find any definite genitalic difference, in spite of the fact that there are excellent specific characters. The two groups are evidently very closely related.

Certainly no further splitting of *Phoebis* into two or more genera seems warranted. If subgenera should be desired the arrangement would be as follows, as based on the genitalia:

Inner lobe present; dorsal spine absent; setiferous pad present, well developed..........*P. Rhabdodryas* G. & S. (*trite*) (5)
Inner lobe present; dorsal spine present, simple; setiferous pad rudimentary or absent......*P. Phoebis* Hübner (*argante*) (1)
Inner lobe absent; dorsal spine present, highly developed; setiferous pad absent..............*P. Aphrissa* Butler (*statira*) (6)

SUMMARY.

1. The New World species usually included in *Catopsilia* Hübner are worthy of generic distinction under the name of *Phoebis* Hübner with *argante* Fabricius as genotype.
2. The relationship of *Catopsilia* is with *Anteos* and *Eurymus* rather than with *Phoebis* and the other Rhodocerine genera.
3. There is in *Catopsilia* a comparatively small number of species which are structurally not very distinct.
4. There is no reason for further splitting of *Phoebis* into other genera. The genus divides into a number of compact groups or into three sub-genera.

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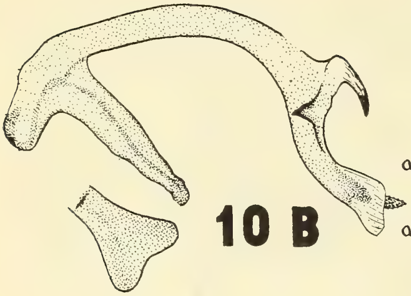
LIST OF FIGURES.

1. Ental aspect, right side, ♂ genitalia, *Phoebis trite* L.
1A. Lateral aspect, setiferous pad, *P. trite* ♂.
1B. Inner lobe of harpe, *P1 trite* ♂.
2. Ectal aspect, left side, ♂ genitalia, *Phoebis trite*.



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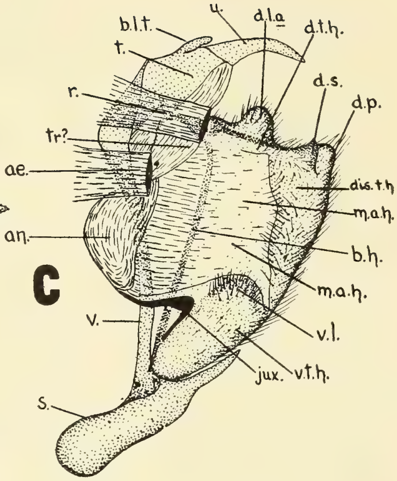
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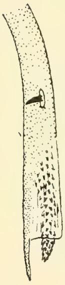

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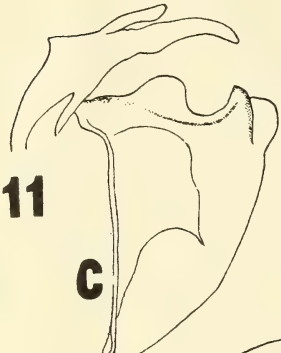

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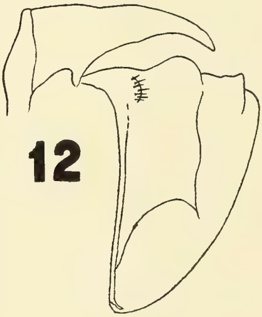

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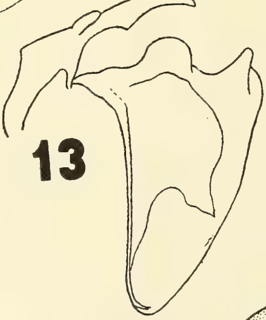

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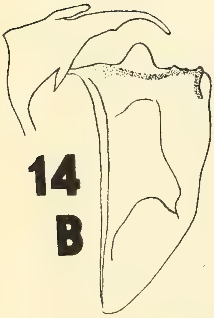

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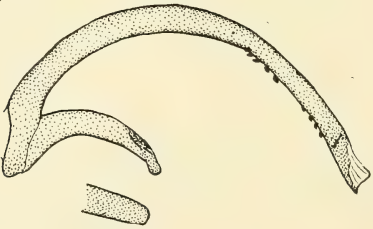

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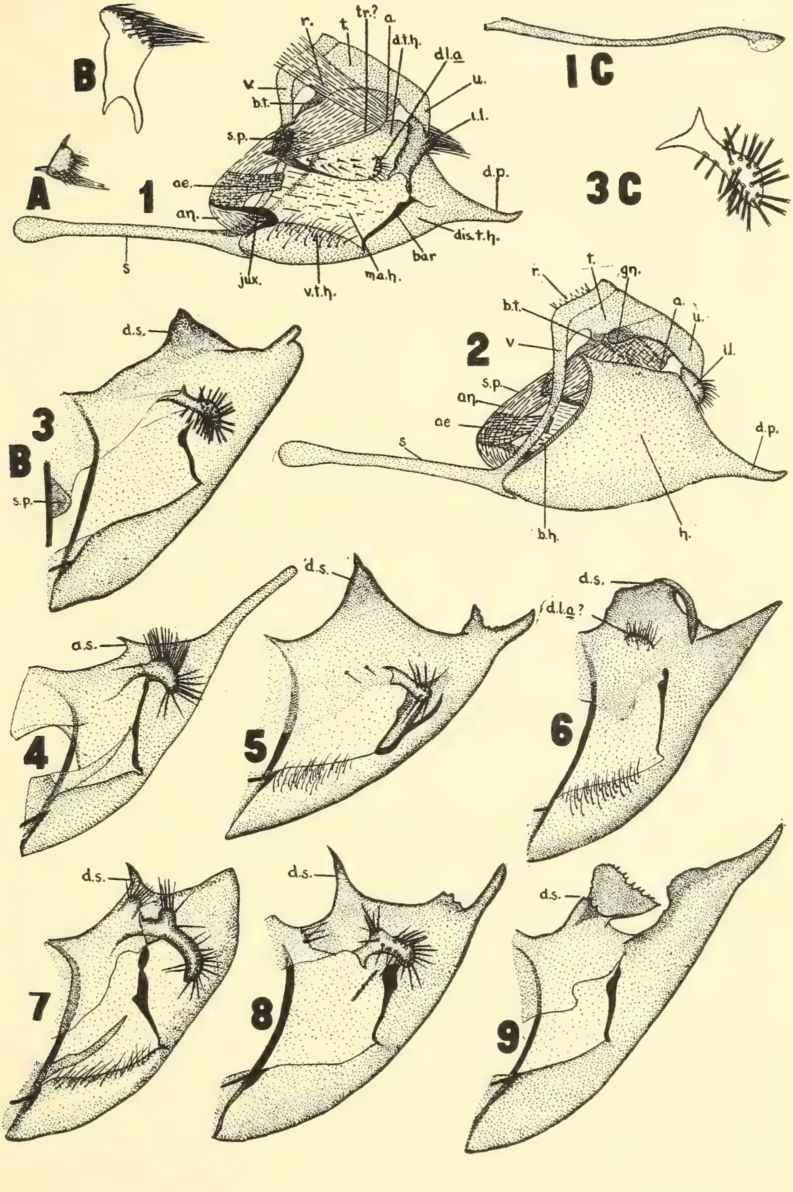
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3B. Ental aspect, right harpe with setiferous pad and part of vinculum, *P. eubule* L.
3C. Inner lobe of harpe, *P. eubule* ♂.
4. Ental aspect, right harpe, *P. philea* L. ♂.
5. Ental aspect, right harpe, *P. rurina* Felder ♂.
6. Ental aspect, right harpe, *P. orbis* Poey ♂.
7. Ental aspect, right harpe, *P. avellanada* Herrich-Schaffer ♂.
8. Ental aspect, right harpe, *P. agarithe* Boisduval ♂.
9. Ental aspect, right harpe, *P. statira* Cramer ♂.
10B. Left lateral aspect, penis, *Catopsilia thauruma* Reakirt ♂.
10C. Ental aspect, right side, ♂ genitalia, *C. thauruma.*
11B. Lateral aspect, tip of penis, *C. florella* Fabricius ♂.
11C. Ental aspect, right harpe and lateral aspect, uncus, *C. florella* ♂.
12. Ental aspect, right harpe and lateral aspect, uncus, *C. scylla* L. ♂
13. Ental aspect, right harpe and lateral aspect, uncus, *C. pyranthe* L. ♂.
14B. Ental aspect, right harpe and lateral aspect, uncus, *C. crocale* Cramer ♂.
14C. Left lateral aspect, penis *C. crocale* ♂.

FURTHER NOTES ON EUREMA HÜBNER (PIERIDAE).

The author has just received an article by Ferreira D'Almeida, from Ann. Soc. Ent. France, XCVII, 369–388, 31 Dec., 1928, which contains many notes and observations on New World *Eurema* (*Terias*) and descriptions of several new forms.

M. D'Almeida claims that there is no reason for believing that geographic races occur in any of the New World species of *Eurema.* In substantiation of this claim he cites the fact that *athalia* Felder and *hahneli* Staudinger are identical with *leuce* Boisduval and are not, therefore, valid races. He furthermore states that variations of *tenella* Boisduval (*nise* Felder) are not caused by geographical distribution but are purely individual. Both of these facts are undoubtedly true, but have nothing to do with geographical variations in the other species of the genus. I think that it is most evident to any student of an adequate collection with adequate data that geographical variation does indeed play a large part in the New World species of *Eurema.* One of the most evident geographic races in the genus, *deva chilensis* Blanchard, from Chile, is placed by D'Almeida as a simple synonym of *deva.* Many other conclusions are similarly most evidently based on an inadequate study of material or of the literature.

Several new forms and aberrations are described, and one new species. These the present writer places as follows:

rubella D'Alm. described as an aberration of *arbela* Hübner; is a synonym of *salome* f. *salome* Felder, representing a variant too minor to be worth retention as a color form. Based on one ♂, from Venezuela.

lurida D'Alm. described as an aberration of *arbela* Hübner; should be placed as a synonym of *arbela arbela,* representing merely a minor variant. Based on one ♂ from Tojujo, Peru.

cissa D'Alm. described as an aberration of *tenella* Boisduval. *Tenella* is a synonym of *nise* Cramer. *Cissa* is merely another minor variant, and so should be placed as a synonym of *nise,* a species already possessing an immense list of synonyms, many of which were previously committed by the same author. Type locality, Rio de Janeiro and Bolivia.

incana D'Alm. described as a ♀ aberration of *elathea* Cramer = ♀ *elathea* f. *medutina;* based on one ♀ from S. Tomé, Argentine.

gracilis D'Alm. described as a form of *elathea* Cramer is a homonym of *gracilis* Avinoff, which is a synonym of *arbela graduata* Butler. The form does not appear worth a name anyway, but might be. Based on one ♂, Matto Grosso, Brazil.

raymundoi D'Alm. described as a new species, based on one ♀ from Santo Tomé, Prov. de Corrientes, Argentine. It is a bit hard to state definitely just what this may be, in the absence of any illustration or of any description of structural characters. It appears to the present writer to be a somewhat reduced ♀ of *albula* f. *tapeina* Bates.

The writer wishes to repeat what he has already stated regarding the naming of minor aberrations, and to emphasize the point. Our system of classification must not be made unwieldy by the addition of numbers of useless names. As matters now stand any specimen possessing a few misplaced scales can be named, and either the name will be accepted as valid or will still further burden an already laden synonomy. The presence of such slight individual variations is of undoubted interest to the special student of variation, but he does not wish to apply scientific names to each one of them any more than the geneticist who, studying a structurally homogeneous species and finding a number of strains in it, will wish to apply scientific names to each one. Doubtless the naming of slight individual variations is of great interest to the person who collects insects as he would collect postage stamps, but the practice is a nuisance to the serious student.

There is also a great deal too much publication by persons who are most imperfectly acquainted with the groups on which they are working and with the literature on the subject. Surely, work on nomenclature should be attempted only by students who have access to large collections and good library facilities. There is plenty of other work, badly needed, for students who have not these facilities. In *Eurema,* for example, nothing is known about the early stages of most of the species. The majority of what is known has been contributed by M. D'Almeida, who has done excellent work in the field.—Alex. B. Klots.

PHYLLOPHAGA AUSTRICOLA—A CORRECTION.

On page 110 of the April, 1929, number of this Journal, the specific name of a new species of Phyllophaga—*P. austricola* as submitted in manuscript—appears as *austricolia.* This is a printer's error pure and simple, and in direct opposition to positive corrections by author and editor in both galley and page proof.

The general inviolability of the spelling of specific names as originally published does not hold, if I properly interpret the "code," in cases of typographical errors which do violence to the manifest wish and intention of the author. The species in question then should be known as *Phyllophaga austricola* Fall.

H. C. Fall.

Note: The problem presented by the typographical error corrected above by Dr. Fall has had the consideration of Dr. C. W. Stiles. He writes with regard to it thus: "I would not hesitate an instant to make the change on the basis of an obvious typographical error under Article 19 of the International Rules of Zoological Nomenclature. This is such an evident case I would go ahead and make the correction without a formal opinion of the Commission." Obviously, this is not a formal ruling; but in case of dissidence from the correction by Dr. Fall, the matter would be referred to the Commission for their final and binding opinion. However, to question this correction would be to admit that in practice the final arbiter in the formation and spelling of zoological names is neither the author nor the Commission, but the unrestrained and irresponsible printer's devil: which is an absurdity.

J. R. de la Torre Bueno, *Editor*

A PARTIAL LIST OF MIRIDAE FROM TEXAS (ORDER HEMIPTERA).

By H. G. Johnston, College Station, Texas.

The following is a partial list of Mirids collected principally by the writer, in the vicinity of College Station, Texas, during the spring and summer, 1928. But little is known of the distribution of the family Miridae in the southwestern part of the United States, thus the following notes might prove of interest. Specimens have been determined by the writer and verified by Dr. H. H. Knight.

Adelphocoris rapidus (Say). College Station, June 2 to Oct. 17, 1928.

Ceratocapsus fuscosignatus Knight. College Station, May 12, to Oct. 20, 1928.

C. punctulatus (Reuter). College Station May 12, to Oct. 12, 1928. This species in company with *fuscosignatus* Knight was taken in large numbers at a trap light.

Creontiades debilis Van D. Port Lavaca, July 31, 1926. (K. P. Ewing).

Deraeocoris sayi (Reuter). College Station, April 5, to May 12, 1928. Common on *Quercus minor.*

D. sayi marginatus Knight. College Station, April 5–11, 1928.

D. sayi unicolor Knight. College Station, April 8–11, 1928.

Heterocordylus malinus Reuter. College Station, April 11, 1928. On *Crataegus.*

Horcias dislocatus gradus Knight. College Station, April 24, to May 15, 1928. Apparently not recorded south of New Jersey. Only this variety was taken.

H. sexmaculatus (Barber). College Station, May 28, 1920. (H. J. Reinhard). Simonton, May 20, 1928. Taylor, May 25–30, 1928. (J. C. Gaines & V. O. McCoy). New Braunfels, June 22, 1927. (H. H. Knight).

Lygus apicalis Fieber. College Station, April 12, to Nov. 1, 1928.

L. fasciatus viridiusculus Knight. Brownsville, Jan. 31, 1928. (R. K. Fletcher).

L. pratensis oblineatus (Say). College Station, Jan. 17, to Nov. 25, 1928. Taylor, May 25, 1928. (J. C. Gains & V. O. McCoy). Simonton, May 20, 1928.

L. (*Neolygus*) *caryae* Knight. College Station, May 5–15, 1928.

L. (*Neolygus*) *caryae subfuscus* Knight. College Station, May 1–5, 1928.

Lepidopsallus rubidus (Uhler). College Station, April 5–11, 1928.

Microphylellus maculipennis Knight. College Station, May 1, 1928.

M. modestus Reuter. College Station, May 1, 1928.

Neocapsus cuneatus Distant. College Station, April 5–11, 1928. This species occurred abundantly on *Quercus minor* during early spring in 1928. Adults began to appear about April 5 and had completely disappeared by April 15. This probably acounts for the fact that the species has so rarely been collected.

Neoborus adelia Knight. College Station, April 12–17, 1928. Breeding abundantly on *Adelia parvifolia* in cool shaded situations.

N. adustus Knight. College Station, April 12, 1928. Taken in company with *canadensis* Van D. on *Fraxinus americana.*

N. canadensis (Van D.). College Station, April 12, 1928. Collected on *Fraxinus* only in humid locations.

Neurocolpus nubilus (Say). College Station, May 1, to Nov. 1, 1928. Simonton, July 26, 1928.

Opistheuria clandestina dorsalis Knight. College Station, July 15, to Oct. 5, 1928.

Orthotylus chlorionis (Say). College Station, April 11–13, 1928.

O. ornatus Van D. College Station, April 11, 1928.

O. ramus Knight. College Station, May 5, 1928. Breeding abundantly on *Carya.*

Paracalocoris scrupeus scrupeus (Say). College Station, April 11, to May 5, 1928.

P. scrupeus bidens McAtee, College Station, May 1, 1928.

P. severini nigriclavus Knight. College Station, April 17, to May 5, 1928. Breeding on *Smilax.*

Phytocoris tibialis Reuter. College Station, October 6, to Nov. 10, 1928.

Pycnoderes balli Knight. College Station, Oct. 12, 1928.

Plagiognathus albatus vittiscutis Knight. College Station, May 12, 1928. Breeding on *Nyssa sylvatica.* Reported by Blatchley from Dunedin, Fla., the only record of it occurring south of the District of Columbia.

P. nigrolineatus Knight. College Station, April 5–11, 1928. Breeds abundantly on *Quercus minor.* The most abundant species ever seen by the writer on any plant.

Platytylellus intercidendus (Distant). College Station, April 24 to Oct. 6, 1928. Simonton, July 26, 1928. Taylor, June 20, 1928. (J. C. Gaines and V. O. McCoy.)

P. rubrovittatus (Stål). College Station, May 1 to June 2, 1928. Simonton, July 26, 1928.

Polymerus basalis (Reuter). College Station, April 12 to Nov. 10, 1928. Castolon, May 25, 1928. (F. F. Bibby.)

P. basalis fuscatus Knight. College Station, Oct. 6 to Nov. 1, 1928.

Psallus seriatus (Reuter). College Station, April 24 to Oct. 12, 1928. Taylor, May 30, 1928. (J. C. Gaines & V. O. McCoy.) Castolon, May 28, 1928. (F. F. Bibby.)

Reuteroscopus ornatus (Reuter). College Station, May 5, 1928. Simonton, July 1, 1928.

R. sulphureus (Reuter). College Station, Sept. 30 to Nov. 1, 1928.

Rhinacloa forticornis Reuter. College Station, Oct. 12, 1928.

Sericophanes ocellatus Reuter. College Station, June 2 to Oct. 6, 1928. Simonton, July 1, 1928.

Trigonotylus brevipes Jak. College Station, Sept. 30 to Oct. 6, 1928.

T. pulcher Reuter. College Station, Oct. 17–21, 1928.

Tropidosteptes cardinalis Uhler. College Station, May 12, 1928. Breeding on *Fraxinus americana* but only in a cool shaded place. Collecting on the same host in other situations did not produce additional specimens.

Cicindela Tranquebarica Horiconensis Leng.—A nice series of this variety was taken on the north sore of Minas Basin in the Town of Portaupique, N. S., on August 25 and 31, 1929. They were found in a recently mown clover field just above tide water, on small bare spots where soil had been removed to build a tide dyke, and on the muddy shore of a small creek in which no fresh water was flowing. The series taken (about 30) include nearly black specimens and grade to decidedly coppery individuals. With them were taken two *repanda* and two *sexguttata.*—C. A. Frost, Framingham, Mass.

PODALONIA VIOLACEIPENNIS (LEPELETIER), A DIMORPHIC FOSSORIAL WASP (HYMENOPTERA).

By J. Bequaert, Harvard University Medical School.

While collecting at Granite Peaks Camp (altitude: 9,000 ft.), near Bayfield, La Plata Co., Colorado, in July 1928, I captured a mated pair of *Podalonia,* the female of which was entirely black, while the abdomen of the male was partly ferruginous. Nothing much was thought of it at the time; but, having been in the habit of noting all Hymenoptera found mating in the field, I kept these two insects on the same pin. When, however, I came to study them with H. T. Fernald's recent monograph of the genus *Podalonia* (1927, Proc. U. S. Nat. Mus., LXXI, Art. 9), I found to my surprise that the female belonged to *P. luctuosa* (F. Smith), while the male was a *P. violaceipennis* (Lepeletier).

Now Fernald states that he saw in the United States National Museum a pair taken in Californa in which a female *luctuosa* was gripped by the mandibles of a male *violaceipennis,* as in mating. Since only one male with the *luctuosa* coloration could be found by him, while females of both *luctuosa* and *violaceipennis* as well as males of *violaceipennis* are very common in collections, he concluded "that the female *violaceipennis* is sometimes dimorphic, *luctuosa* being one of the female forms, and that in very rare instances the male also becomes entirely black."

The pair which I obtained in Colorado confirms this conjecture. Moreover, Professor Fernald, to whom I wrote about my observation, kindly informed me that *P. violaceipennis* was recently raised from a *P. luctuosa* parent. There can then be no longer any doubt that *P. violaceipennis* is a dimorphic species. In the typical and more common form, which occurs across the Continent over most of southern Canada and the United States, the abdomen is more or less extensively ferruginous in both sexes. In the race *luctuosa,* the female is entirely black, while the male is usually colored like that of the typical form, although very exceptionally it may be colored like the female *luctuosa;* this race is more limited in its distribution, as it occurs together with the typical form in the more northern and the mountainous portions of the general range of the species.

It is of additional interest that a common European species of the same genus, *Podalonia hirsuta* (Scopoli), exhibits a similar dimorphism, according to F. F. Kohl. Normally both sexes have the abdomen partly ferruginous; but in some localities the abdomen of most females is entirely black, while the males are yet almost all partly ferruginous; entirely black males are extremely rare. Such clear-cut cases of color dimorphism, apparently sex-linked within one species, are by no means rare among some other orders, notably among the Lepidoptera. They are, however, exceptional among the Hymenoptera.

A FEW LATE SPRING BUGS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Insects found in Spring always arouse interest. Are they of a new brood? Are they overwintering adults?

On Memorial Day (May 30), 1924, I sifted for bugs on the damp edges of the woodland surrounding a small cattail and bunch grass swamp, near White Plains. Here were the usual overwintering adults of *Eremocoris ferus, Antillocoris pallidus, Euschistus tristigmus,* and, naturally, *Cymus angustatus.* Two of the captures, however, were of added interest. One was the extremely rare fully winged *Hypogeocoris piceus,* found by sweeping close to the ground in young grasses, but only a singleton. The other was two nymphs of what I take to be *Aradus robustus,* principally from the form and structure of the antennae. These were sifted from damp leaves. I took them home alive for observation. The two were placed on a piece of paper, where for a short time they played 'possum, stiff and motionless, the antennae held nearly parallel, pointing straight ahead. After a minute or so, first one antenna and then the other moved apart. Soon the one antenna began to tremble, or rather, *vibrate* over the paper with a touching motion; then the second one came into play and the bug moved slightly, then staying quite still. Both remained thus quiet for a minute or two, when they were picked up to be put in a Stender dish with the little wad of damp leaves in which they had been brought home. The instant the forceps touched them, they came to life and attempted to run away in lively fashion. As soon as they found themselves on the leaves, they walked freely and briskly about. Their color and markings are such as to harmonize perfectly with the color of the dead dampish leaves.

COLEOPTERA FROM NORTHERN CALIFORNIA.

By Howard Notman, Brooklyn, N. Y.

An automobile collecting trip during the summer of 1927 produced among other results nearly 1000 specimens of coleoptera from the following localities in northern California; Trinidad and Arcata, Humboldt Co., Redding, Shasta Co., Cedar Pass and Cedarville, Modoc Co. Trinidad and Arcata are in the humid and heavily forested coast region. At Trinidad collecting was done along the inner edge of an ocean beach; at Arcata on the gravel and sand bars in the mouth of the Mad River. Redding is at the northern end of the hot and semi-arid central valley of California. Collecting was done on gravel and sand bars on the shore of the Sacramento river, elevation about 580 ft. Cedar Pass in the Warner Mountains has an elevation of about 6400 ft. Collecting was done in a forested ravine on the westerly side. At Cedarville collecting was done in a salt marsh near the eastern shore of the Middle Alkali Lake, elevation about 4700 ft., the latter being entirely dry at the time. This is a desert region east of the Pacific divide which extends along the crest of the Warner Mountains. Lists of the Carabidae taken follow.

Trinidad, Humboldt Co., Cal., July 27, 1917.

Dyschirius gibbipennis Lec.
Bembidion funereum Lec.
Bembidion iridescens Lec.
Bembidion optalum Csy.
Trechus ovipennis Mots.
Pterostichus crenicollis Lec.
Pterostichus suffusus Csy.
Anchomenus brunneomarginatus Mann.

In addition to the above Carabids *Omophron ovale* Horn was taken in considerable numbers.

Arcata, Humboldt, Co., Cal., July 28, 1927.

Nebria eschscholtzii Mén.
Dyschirius truncatus Lec.
Bembidion zephyrum Fall.
Bembidion obliquulum Lec.
Bembidion oppressum Csy.
Bembidion vespertinum Csy.
Bembidion adjutor Csy.
Bembidion erosum Mots.
Bembidion tetracolum Say.
Bembidion indistinctum Dej.
Bembidion derisor Csy.
Bembidion ephippigerum Lec.
Bembidion gregale Csy.
Bembidion caseyi Leng.
Bembidion dubitans Lec.
Parargutor lustrans Lec.
Anchomenus funebris Lec.
Apristus laticollis Lec.
Stenocellus sejunctus Csy.
Glycerius nitidus Dej.

Redding, Shasta Co., Cal., August 1, 1927.

Dyschirius analis Lec.
Schizogenius lineolatus Say.
Schizogenius depressus Lec.
Bembidion tritum Csy.
Bembidion recticolle Lec.
Bembidion haplogonum Chaud.
Bembidion flavopictum Mots.
Tachyura rapax Lec.
Tachyura apacheana Csy.
Tachyura sedula Csy.
Tachyura profuga Csy.
Lachnophorus elegantulus Mann.
Apristus laticollis Lec.
Chlaenius viridifrons Esch.
Agonoderus rugicollis Lec.

Cedar Pass, Modoc Co., Cal., August 3, 1927.

Bembidion lubricum Csy.
Bembidion commotum Csy.
Bembidion iridescens Lec.
Bembidion nebraskense Lec.
Bembidion tritum Csy.
Bembidion nevadense Ulke.
Bembidion vile Lec.
Bembidion flavopictum Mots.

Also two species of *Bembidion,* a species of *Anchomenus* and a species of *Agonoderus* as yet unidentified.

Cedarville, Modoc Co., Cal., August 3, 1927.

Bembidion ephippigerum Lec.
Bembidion imperitum Csy.
Bembidion provoanum Csy.
Bembidion mormon Hayw.
Bembidion dejectum Csy.
Bembidion diligens Csy.
Bembidion vile Csy.
Bembidion insulatum Lec.
Bembidion demissum Csy.
Bembidion flavopictum Mots.
Bembidion timidum Lec.
Tachys corax Lec.

Winter Homes for Mosquitoes.—On August 25, 1929, while resting in a rather dense growth of small oaks on a side hill running down into a large spring-hole in Framingham, I was much interested to observe many mosquito-like Diptera suddenly fly out of a woodchuck burrow into which I had idly tossed a stone. It was about noon after a cool night and the dense growth had prevented any appreciable rise in temperature there. They continued to emerge after each stone until a very large number had come out. On Sept. 15 Dr. J. P. Bill, of Wayland, and myself visited the place and collected some of the insects that were routed out of several burrows which appear to be abandoned. From this catch Mr. C. W. Johnson identified some 20 males and females of *Culex pipiens L.,* one *Drosophila funebris Fall.,* one *Drosophila transversa Fall.* and one small *Tipulid.*—C. A. Frost, Framingham, Mass.

CONTRIBUTION TO OUR KNOWLEDGE OF AMERICAN THYSANOPTERA.

By Dudley Moulton, San Francisco, California.

Two species, namely *Taeniothrips dianthi,* Pr. and *Thrips discolor,* Halid. and the three genera, *Lispothrips,* Reut., *Thorybothrips,* Pr., and *Docessissophothrips,* Bagnall represented herewith by new species, are now recorded from North America for the first time. The distribution of five known American species is extended into new territory. In all, twelve new species and the male of *Thrips* (*Microcephalothrips*) *abdominalis,* Crawford are described in this paper.

TEREBRANTIA, 1836

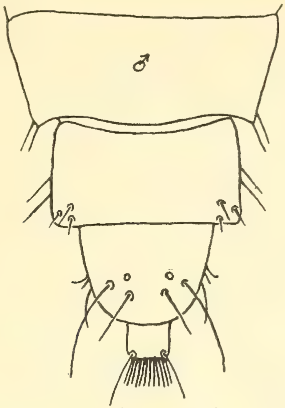
Family Orothripidae Bagnall

Erythrothrips fasciculatus n. sp. (Fig. 1).

Female, holotype. Body color dark brown with red pigment. Antenna uniformly dark brown except segment three which shades gradually from brownish yellow at base to yellowish brown at tip. Fore wings colored as in *arizonae* Moulton, whitish in anterior half with a dark brown longitudinal band in posterior half. This band extends from extreme base of wing including scale and is a little broader near center of wing.

Total body length 2.2 mm.; head, length .27 mm., width .19 mm.; prothorax, length .21 mm., width .22 mm.; mesothorax, width .36 mm.; length of ninth abdominal segment .18 mm., width at base .22 mm. Segments of antennae: length (width) III, 93 (27); IV, 84 (27); V, 57 (27); VI, 54 (25) VII, 63 (24); VIII, 24; IX, 15; total length 470 microns. Length of spines on ninth abdominal segment 240 μ, length of spines on tenth abdominal segment 225 μ. Sense areas on antennal segment III, 16 μ, IV, 30 microns.

Male, allotype. Total body length 1.5 mm.; head, length .18 mm., width .18 mm.; prothorax, length .165 mm., width .20 mm.; mesothorax, width .28 mm. Length of ninth abdominal segment .06 mm., width .12 mm. Segments of antennae: length (width) I, 27 (32); II, 48 (30); III, 87 (24); IV, 72 (26); V, 57 (24); VI, 57 (24); VII, 60 (24); VIII, 24; IX, 12; total length 440 microns. Spines on tenth abdominal segment, outer 120 μ, inner 82 microns. Sense areas on antennal segments III, 15, 9 μ; IV, 30, 21 microns of first and second paratypes.



Erythrothrips fasciculatus.

Type Material: Female holotype, male allotype, ten ♀ and three ♂ paratypes taken on *Adenostoma fasciculatum,* yellow clover, and California sage. Types in author's collection. (Moulton, Nos. 699, 713, 735, 1744, 2782, 2784 and 2984.)

Type Locality: California.

This species has the general color and appearance of *E. arizonae* Moulton, but may be readily distinguished from it by the following characters: a gradual shading of the third antennal segment rather than an abrupt change of color in the middle as in *arizonae*; the smaller third and fourth antennal segments, and the much smaller sense area in segment three, 13–16 μ, as compared to approximately 60 μ, in *arizonae.*

The most striking difference, however, is found in the male. In this new species the last three abdominal segments are much shorter and broader and the eighth segment has two spines at each posterior angle and a series of vestigial hairs at the sides, and the ninth segment has two spines in the middle of each side. In *arizonae* segment eight has an arrangement of ten to twelve long, evenly placed hairs extending almost the full length of the segment and segment nine has three or four long hairs at the side.

Erythrothrips bishoppi n. sp.

Female, holotype. Body color dark blackish brown except third antennal segment which is yellow in basal third, shading rather gradually to dark brown in outer third. Fore wings whitish in anterior half and dark brown in posterior half, extending to extreme base, including scale.

Total body length 2.33 mm.; head, length .18 mm., width .21 mm.; prothorax, length .21 mm., width .25 mm.; mesothorax, width .54 mm. Length of ninth abdominal segment .165 mm., width at base .21 mm.; fore wings, width in middle, .165 mm. Segments of antennae: length (width) I, 45 (42); II, 69 (39); III, 105 (30); IV, 99 (33); V, 69 (30); VI, 69 (30); VII, 60 (27); VIII, 30 (18); IX, 15; total length 510 microns. Length of spines: on ninth abdominal segment 240 μ, on tenth abdominal segment 255 μ. Number of spines on costa 60, fore vein 34, hind vein 26. Maxillary palpi with 7, labial palpi with 4 segments. Sense areas on antennal segments III, 33; IV, 66 microns.

Type Material: Female holotype taken on black walnut, April 13, 1927 (F. C. Bishopp), and named in honor of the collector. Types in author's collection. (Moulton, No. 2171.)

Type Locality: Sonora, Texas.

This species has the general appearance of *E. arizonae* Moulton, but may be separated from it by the shorter and broader head. In *bishoppi* the head is wider than long, while in *arizonae* it is noticeably longer than wide, third and fourth antennal segments are shorter, 133 μ and 120 μ in *arizonae* as compared with 103 μ and 100 μ in this species. The colored band on the fore wings is of nearly uniform width along posterior half and noticeably darker than in *arizonae*. The sixth to ninth abdominal segments gradually decrease in size, while in *arizonae* the eighth abdominal segment is rather more abruptly narrowed.

Erythrothrips keeni n. sp.

Female, holotype. Body color blackish brown except third antennal segment which is abruptly yellowish brown in basal two-thirds and fourth to sixth abdominal segments which are somewhat lighter. Basal third of fore wings whitish except for the dark brown scale, distal two-thirds with a dark longitudinal band along posterior margin, broadening somewhat in the middle and at tips.

Total body length (abdomen distended) 2.37 mm.; head, length .25 mm., width .216 mm.; prothorax, length .216 mm., width .266 mm.; pterothorax, width .40 mm.; length of ninth abdominal segment along median dorsal line .183 mm., of tenth .166 mm. Segments of antennae: length (width) I, 51 (45); II, 60 (36); III, 141 (33); IV, 112 (33); V, 75 (30); VI, 72 (30); VII, 69 (30); VIII, 33 (18); IX, 18; total length 630 microns. Spines on ninth abdominal segment 291 μ, on tenth 270 μ. Sense areas on antennal segments III, 48–48 μ, IV, 63–69 microns.

Male allotype: Colored as in female.

Total body length (abdomen normal) 1.66 mm.; head, length .216 mm., width .183 mm.; prothorax, length .183 mm., width .20 mm.; pterothorax, width .25 microns. Antennae broken off.

This species is very similar to *E. arizonae* Moulton, especially in the color of the third antennal segment but is distinctly different in the coloring of the fore wings, being light colored in the basal third except for scale, while in *arizonae* the dark longitudinal band is continued from extreme base to tip of wing. The difference between the two species is more readily noted in the arrangement of hairs and spines on the seventh, eighth and ninth abdominal segments of the ♂, especially on the eighth and ninth segments. In *arizonae* the seventh segment has a group of four or five rather prominent spines at the sides near the back and on the posterior angles, the longest of these spines at the angles is about 54 μ long. The eighth segment has a series of about twelve long hairs (75 μ) along the sides and distributed evenly from near anterior margin to posterior margin. In *keeni* Moulton there is a group of about twelve hairs arranged in two or three rows and placed at the sides in the third quarter of the seventh abdominal segment. There are no spines at the anterior half but on either side of the posterior angle there is a group of about twelve short dark spur-like bristles. There is a similar group of about twelve hairs on posterior third. In *fasciculatus* Moulton there is a darker colored, slightly enlarged swelling on either side near the posterior margin of segment seven which bears a group of several very short inconspicuous hairs, the eighth segment has two or three short spines at each posterior angle but is without the conspicuous series of long hairs at the sides.

Type Material: Female holotype, male allotype and one paratype taken on *Chrysolamus,* August 15, 1927, by F. P. Keen and named in his honor. Types in author's collection. (Moulton, No. 2515.)

Type Locality: Bly, Oregon.

I am also placing in this species two female specimens, one taken by the writer on *Mentzelia laevicaulis,* July 31, 1926, at Markleyville, and one in blossoms of White Yarrow at Everett Pass, Alpine County, California, on the same date. (Moulton, Nos. 963 and 964.)

Family HETEROTHRIPIDAE Bagnall.

Heterothrips auranticornis Watson.

Two female specimens taken on *Helianthus decapetalus,* September 4, 1927, in Yankton County, South Dakota, by Mr. A. W. Larrabee. (Moulton, No. 2629.) This extends the habitat of the species into the Rocky Mountain States.

Heterothrips gillettei n. sp.

Female holotype: Body color dark chestnut brown with diffused orange pigmentation. All femora, middle and hind tibiae uniformly dark brown, fore tibiae lighter, shading to yellowish in center and at tips, fore tarsi yellowish, middle and hind tarsi light brown. Antennal segment two dark brown, concolorous with head, one lighter brown, three yellow, colored brown in distal fourth, fore to nine brown with four slightly lighter at tip where sensoria are placed. Wings uniformly brown.

Total body length 1.36 mm.; head, length .133 mm., width .14 mm.; prothorax, length .133 mm., width .216 mm.; mesothorax, width .26 mm. Antennae: length (width) I, 21 (30); II, 36 (27); III, 51 (24); IV, 42 (21); V, 30 (18); VI, 30 (18); VII, 22 (12); VIII, 18 (10); IX, 21; total length 270 microns. Median dorsal spines on seventh and eighth abdominal segments 60 μ, on ninth and tenth 51 microns.

Head as long as wide, with deep crescent-shaped pits in front which receive the basal segments of antennae. Anterior margin of eyes sharply protruding. Antennae placed close together, not over 9 mm. apart. Cheeks very slightly arched, back of head with coarse striations. All head spines small. Eyes with coarse facets. Anterior ocellus small, directed forward, posterior ocelli large, contiguous with inner margins of eyes, three to four times greater in diameter than facets of eyes. Mouth cone short and blunt. Antenna twice as long as head, segment two widest, three longest, three and four with bands of sensoria at distal ends.

Prothorax as long as head, 1.6 wider than long, without prominent spines, with broadly rounded posterior angles and margin. Pronotum faintly reticulate, sculptured with fine dots within the reticulations. Setae scattered. Mesothorax broadest, metathorax smaller with posterior angles rounded to union with abdomen. Legs fairly stout. Wings fully developed, with spines as follows: costa, 1–32, fore vein 23, hind vein 18.

Abdomen elongate-ovate with a pair of closely placed median dorsal spines on segments two to eight, posterior margins of segments one to five bordered with a fringe of spines at the sides which are placed singly and not joined into plates. The posterior margin of segment one without spines in the center but two to five inclusive with a center fringe of four or five spines, this fringe complete on segments six, seven and eight. Dorsal surface of all segments indistinctly reticulate and sparingly setose at the sides.

Male allotype. Colored as in the female but with antennal segment four also somewhat lighter, especially at the tip.

Total body length 1.08 mm.

Abdominal sternites without ventral depressions. Wings fully developed.

Type Material: Female holotype, male allotype, 8 ♀♀, 6 ♂♂ paratypes taken on "rat-tail weed" (Moulton, No. 1037) and yellow sweet cloved (Moulton, No. 1027), July 10, 1926 (Prof. C. P. Gillette), and named in honor of the collector. All types in author's collection.

Type Locality: Fort Collins, Colorado.

This species belongs in that group in which the abdominal tergites are fringed posteriorly with hairs which are not coalesced into plates. It is most closely related to *H. auranticornis* Watson, but may be separated by the following characters: *gillettei* has all femora and middle and hind tibiae uniformly brown, antennal segments four, five and six brown, with four only a shade lighter, especially in the male. In *auranticornis* the tips of fore femora, both ends of middle and hind femora and tibia are brownish yellow, antennal segments three and four are yellow, conspicuously shaded with orange, five is yellow in basal two-thirds and six in basal half.

Family THRIPIDAE Uzel.

Subfamily *Heliothripinae* Karny.

Heliothrips bishoppi n. sp.

Female holotype: Color dark chestnut brown. Antennal segments one, two and six to eight concolorous with head, three and four brownish yellow at both ends, darker in the middle, five brownish yellow in basal third shading to dark brown in distal two-thirds. Fore femora and tibia brownish yellow but darker in the middle, middle and hind femora dark brown, middle and hind tibia yellowish at both ends, dark brown in the middle, all tarsi yellow. Wings clear except for a dark cross band at forking of veins which is continued into a longitudinal band along posterior margin and broadened again to form a dark band at tip.

Total body length 1. mm.; head, length .10 mm., width .15 mm.; prothorax, length .116 mm., width .17 mm.; pterothorax, width .25 mm. Antennae: length (width) III, 45 (21); IV, 48 (22); V, 39 (21); VI, 27 (18); VII, 15; VIII, 30; total length of segments III to VIII 240 microns.

This species is very similar to *H. punctipennis* Hood, but may be easily separated from that species by the color of the legs which are clear lemon yellow, in *bishoppi* the middle and hind legs are distinctly dark brown but brownish yellow at the joints.

Type Material: Female holotype taken on *Quercus* sp., April 17, 1927 (F. C. Bishopp), and named in honor of the collector. Holotype in author's collection. (Moulton, No. 2177.)

Type Locality: Menard, Texas.

Subfamily SERICOTHRIPINAE Karny.

Tribe *Sericothripini* Priesner, 1926.

Sericothrips langei n. sp.

Female holotype. Color dark brown, pterothorax somewhat lighter. Antennal segments one to four whitish yellow with the first segment slightly brownish, five whitish yellow at base, gradually shading to brown at tip, six to eight brown. All femora brown but yellowish at base, all tibiae brownish in basal halves yellowish in distal halves, tarsi yellow. Fore wings clear at base, middle and tip, with two intervening brown bands. Crescents of ocelli orange red.

Total body length 1 mm.; head, length .09 mm., width .165 mm.; prothorax, length .12 mm., width .18 mm.; pterothorax, width .24 mm.; abdomen, width .24 mm. Segments of antennae: length (width) I, 15 (24); II, 30 (24); III, 39 (18); IV, 36 (17); V, 33 (16); VI, 45 (18); VII, 9; VIII, 12; total length 222 microns. Length of spines: interocellars 21 μ, on posterior angles of prothorax 30 μ, on posterior angles of ninth abdominal segment 51 μ, on tenth segment 60 microns.

Head 1.8 times wider than long, flattened in front; cheeks straight. Back of head with conspicuous transverse, wavy lines, occipit line especially strong behind posterior ocelli. Four distinct spines on anterior margin of head, about as long as those in front of posterior ocelli. Eyes large, with coarse facets. Ocelli approximately as large as facets of eyes. Mouth cone short, reaching only four-fifths over prosternum, broad at base and rounded at tip.

Prothorax with three distinct spines on each posterior angle, the outer two small and curved, the inner one moderately long, about twelve spines scattered over pronotum. Pterothorax also with distinct lineations. Wings normal, fore vein with twenty-two spines, one near center of outer dark cross band where second vein should appear. Microscopic setae very close and prominent on the sides of abdominal segments but very faint in the center, comb-like arrangement of spines conspicuous at sides along posterior margins of segments one to seven, a complete comb on segment eight.

Type Material: Female holotype and two ♀ paratypes taken by sweeping, August 30, 1921, by Mr. R. C. Lange, after whom the species is named. Types in author's collection. (Moulton, No. 780.)

Type Locality: Fish Lake, Illinois.

This species is clearly separated from other members of the genus by its uniform body color and the banded wings with transparent tips.

Tribe *Dendrothripini* Priesner, 1926.

Anaphothrips crassicornis n. sp.

Female holotype: Color clear yellow with thorax and margins of femora and tibiae shaded a little darker. First antennal segment whitish, two clear yellow, three four and five yellowish white at base shading to gray brown at tip, six gray brown lighter at base, seven to nine gray brown. Wings yellow, prominent body and wing spines brown. Crescents of ocelli orange.

Total body length 1. mm.; head, length .09 mm., width .13 mm.; prothorax, length .10 mm., width .15 mm.; mesothorax, width .20 mm.; metathorax, width .18 mm. Antennae: length (width) I, 18 (21); II, ? (24); III, ? (21); IV, ? (21); V, 33 (21); VI, 30 (21); VII, 6 (15); VIII, 9; IX, 12; total length 180 (?) microns. Length of spines: a single one on each posterior angle of prothorax 30 μ, outer pair on posterior angle of ninth abdominal segment 75 μ, median inner pair 36 μ, median dorsal pair on tenth abdominal segment 60 microns.

Head transverse, broadly flattened in front; cheeks slightly arched, without prominent spines or markings. Eyes semispherical. Ocelli present but not strongly developed. Mouth cone broad at base, angular at pit, reaching posterior margin of prosternum. Antenna compact, approximately twice as long as head, clearly with nine segments having a 3-segmented style.

Prothorax 1.5 wider than long with a single moderately stout spine at each posterior angle and a series of four on either side along posterior margin, about twenty short brown spines scattered over dorsum. Mesothorax broadest with sides strongly arched, metathorax smaller, especially where it joins mesothorax. Median dorsal pair of spines on metanotum, placed well back from anterior margin. Legs normal. Wings fully developed with spines as follows: costa 24, fore vein 1–3 at base followed by a short intermission, then a series of fifteen regularly placed spines reaching to tip, hind vein with 13.

Abdomen elongate-ovate, outer pair of spines on posterior margin of ninth segment clearly twice as long as the inner pair, spines on segment ten intermediate between the two. Fully developed comb along posterior margin of segment eight.

Allotype male: colored as in female. Total body length .9 mm. Antennae: length (width) I, 15 (15); II, 27 (24); III, 27 (18); IV, 30 (18); V, 30 (18); VI, 27 (61); VII, VIII and IX, 27. Spines on fore wings as follows: costa 19, fore vein 4–7–1–1, an intermission, 4 near tip, hind vein 9. Ninth abdominal segment with a median pair of short spurs 15 μ long, and a single spine on either side outward and anterior to these 27 μ.

Type Material: Female holotype, male allotype taken July 5, 1926 (W. M. Shackleford). Host plant unknown. Type in author's collection. (Moulton, No. 1647.)

Type Locality: Champagne County, Illinois.

This species is distinct from any previously described American species because of its compact and clearly 9-segmented antenna and the almost regular placement of spines on the fore-longitudinal vein of fore wings in the female. Intermediate antennal segments are somewhat more slender in the male and the intermissions in the arrangement of spines on the fore veins of fore wings are more distinct.

Subfamily *Thripinae* Karny.

Odontothrips loti Haliday.

Euthrips ulicis californicus Moulton, 1907. Thysanoptera of California, U. S. Dept. of Agric. Tec. Ser., No. 12, Pt. III, p. 55.)

Odontothrips californicus Moulton, 1927. (Pan.-Pac. Ent., Vol. IV, No. 1, page 34.)

I have been able to compare our American species with specimens of *O. loti* Hal., kindly sent to me by Dr. H. Priesner and find the two species identical. A wider distribution is also recorded from the following collections:

3 ♀♀ taken on *Lupinus argenteus* at Stillwater, Colorado, July 18, 1926, by Alvah L. Pearsall. (Moulton, No. 992.)

1 ♀ taken on *Malus* sp. at Colorado Springs, Colorado, May 14, 1926, by G. W. Goldsmith. (Moulton, No. 1158.)

1 ♀ taken on wild lucerne at Toga, Virginia, June 19, 1927, by J. V. Gilmore. (Moulton, No. 2090.)

Frankliniella insularis Franklin.

Numerous specimens taken on legumes and other unnamed plants at Bear Camp, Catalina Mountains, Arizona, on April 24, 1926, by Messrs. C. T. Vorhies and A. A. Nichols. (Moulton, Nos. 1856 and 1864.)

This record extends the range of this species to the south western states.

Ctenothrips frosti n. sp.

(Brachypterous.)

Female, holotype. Color of head and thorax blackish brown, abdomen black, all femora blackish brown, light yellow at extreme base, tibiae dark brown, lighter along center, tarsi yellowish brown. Antennal segments one and two blackish brown, two lighter towards tip, three yellowish brown, four yellowish brown in basal third, dark brown in outer two-thirds, five yellowish brown at extreme base, shading to dark brown in outer half, six to eight blackish brown.

Total body length 1.76 mm.; head, length .19 mm., width across eyes .21 mm.; prothorax, length .15 mm., width .27 mm.; pterothorax, width .36 mm.; abdomen, width .54 mm. Segments of antennae: length (width) I, 30 (33); II, 42 (30); III, 87 (24); IV, 69 (24); V, 60 (21); VI, 81 (21); VII, 12; VIII, 24; total length 405 microns.

Head approximately as long as wide, constricted behind eyes but not as deeply as in *Ctenothrips bridwelli* Franklin. Back of head with coarse, transverse, anastomosing striations. All head spines relatively short, a pair anterior to ocelli and near anterior inner margins of eyes. Interocellars placed between posterior ocelli with a series of three or four on either side behind eyes. Eyes large, protruding, with coarse facets. Ocelli fully developed. Antennae normal to the genus.

The anastomosing transverse lines of prothorax much less distinct than on head, entire surface stippled with light colored dots, mesonotal plate more clearly lined than the pronotum and metanotum, distinctly reticulate. Lines on femora rather distinct, on tibiae hardly visible. Wings reduced to very short pads.

Abdomen broadly ovate, much wider than pterothorax, first segment clearly reticulated, eighth segment with fully developed, long-toothed comb.

Type Material: Female holotype taken by sifting, March 24, 1928, by Mr. C. A. Frost and named in his honor. Type in author's collection. (Moulton, No. 3066.)

Type Locality: Sherborn, Massachusetts.

This species is clearly separated from *reticulatus* Crawford, by the absence of conspicuous reticulations on the thorax and legs and may be separated from *bridwelli* Franklin, by the darker colored third, fourth and fifth antennal segments. It approaches *floridensis* Watson perhaps most closely, but this latter species is described as having the pronotum with deep polygonal reticulations which are very indistinct on the pronotum in this new species.

Taeniothrips dianthi Priesner.

Two female specimens taken on *Dianthus plumarius* at Vernon, British Columbia, Canada, June 3, 1927, by Mr. A. H. Ruhman (Moulton, No. 2047) and two specimens taken from *Dianthus* sp., July 4, 1927, at Shenandoah, Iowa, by Mr. S. C. Jones (Moulton, No. 2394).

This is the first finding of this species in North America, it having been known previously only in Central Europe.

Thrips discolor Halid.

One female taken from Buttercups, July 11, 1926, by Dr. W. E. Britton, Salisbury, Conn. (Moulton, No. 1124), and one specimen taken from Buttercups, July 5, 1926, by Mr. H. Notman, Keene Valley, New York (Moulton, No. 1240).

This is the first record for this thrips in North America, previously known only from Europe.

Thrips gilmorei n. sp.

Female, holotype. Body color deep brown with much red hypodermal pigment in thorax and abdomen. Segments one and two of antennae deep brown with red hypodermal pigment, three to seven clear yellow with a shade of brown in basal quarter of segment three, distal half of six and all of seven light yellowish brown. Legs uniformly deep brown. Fore wings uniformly brown but clear in basal fifth. Crescents of ocelli deep orange red. All prominent body spines dark brown.

Total body length 1.5 mm.; head, length .15 mm., width .15 mm.; prothorax, length .14 mm., width .20 mm.; pterothorax, width .27 mm.; abdomen, width .28 mm. Segments of antennae: length (width) I, 24 (30); II, 33 (27); III, 57 (24); IV, 57 (21); V, 28 (18); VI, 60 (18); VII, 24; total length 300 microns. Length of spines: interocellars 21 μ, on posterior angles of prothorax 72 μ, outer pair on ninth abdominal segment 129 μ, inner 100 μ, on tenth abdominal segment 105 microns.

Head clearly as long as wide, constricted behind eyes and then somewhat swollen, with prominent broken transverse lines on back of head. Interocellar spines placed on a line connecting posterior ocelli with anterior ocellus. A series of three spines on either side behind eyes. Eyes prominent, with coarse facets, conspicuously pilose. Ocelli large. Antenna slender, twice as long as head.

Prothorax with two long spines at each posterior angle and two on either side along posterior margin, the innermost being about twice as long as the outer. A pair of well developed spines near center of metanotum, placed well back from anterior margin. Legs semi-reticulate and rather densely clothed with short dark spines. Wings fully developed, anterior vein with 3–3 basal bristles and three distal bristles, posterior vein with 14.

Abdomen long and slender, comb along posterior margin of eighth segment complete but weak, suture on tenth segment extending two-thirds its length.

Male allotype: Coloring as in the female. The first two antennal segments deep brown but showing more red hypodermal pigment, three to five yellowish but indistinctly light brown at the tips, six lighter in basal fourth, brownish yellow in outer three-fourths.

Total body length 1.2 mm.; length .14 mm., width .13 mm.; prothorax, length .10 mm., width .16 mm.; pterothorax, width .21 mm.; greatest width of abdomen .15 mm. Ventral depressions on sternites two and three large, ovoid in shape and rather conspicuous but appear to be wanting on other sternites.

Type Material: Female holotype and male allotype taken on hickory, June 22, 1927, by Mr. J. W. Gilmore, and named in his honor. Types in author's collection. (Moulton, No. 2093.)

Type Locality: Appomatox, Virginia.

This species would seem to be most closely related to *T. physapus* Linn., but is easily separated from that species by its relatively longer head, straighter cheeks and with little or no constriction at the base, also uniformly light color of the distal three-fourths of the third, fourth and fifth antennal segments in the female. *Gilmorei* is distinguished also by its uniformly dark brown legs, including the tarsi.

Thrips (*Microcephalothrips*) *abdominalis* Crawford (Syn. *Thrips gillettei* Moulton).

Numerous specimens of this species were found in a collection made on *Hymenopappus carolinense* on March 31, 1927, at Bastrop, Texas, by Mr. Hugh A. Duval (Moulton, No. 1832). The series included three males heretofore unknown so I am offering a brief description.

General color as in the female.

Total body length .7 mm.; head, length .066 mm., width across eyes .093 mm.; prothorax, length .096 mm., width .126 mm.; pterothorax, width .156 mm.; abdomen, width .15 mm. Segments of antennae: length (width) I, 15 (18); II, 21 (18); III, 27 (15); IV, 24 (15); V, 21 (14); VI, 33 (15); VII, 12; total length 170 microns.

General shape of head and thorax as in the female. Abdomen more slender, segments with irregular comb-like teeth along posterior margins, tergites faintly cross striate, ventral depressions on sternites three to seven very small, almost round, 10–12 μ in diameter.

TUBULIFERA, 1836.

Family PHLOEOTHRIPIDAE Hood.

Subfamily *Phloeothripinae* Priesner.

Tribe *Hoplothripini* Priesner.

Cephalothrips elegans n. sp.

Female, holotype. Color yellowish brown, abdomen somewhat lighter, tube darker and concolorous with head, tips of fore femora, all tibiae and tarsi yellow. Antenna uniformly brown, except tip of segment two and basal half of three which are yellowish. Body spines clear yellow.

Total body length 1.5 mm. (abdomen distended); head, length .15 mm., width .13 mm.; prothorax, length .105 mm., width (including coxae) .18 mm.; tube length .108 mm., width at base .051 mm. Segments of antennae: length (width) I, 21 (27); II, 39 (25); III, 39 (25); IV, 39 (25); V. 39 (24); VI, 39 (20); VII, 36 (18); VIII, 24; total length 276 microns. Length of spines: postoculars 45 μ, on anterior angles of prothorax 27 μ, mid-laterals 39 μ, on posterior angles, outer 48 μ, inner 39 μ, on ninth abdominal segment 150 μ, at end of tube 160 microns.

Head 1.2 longer than wide and 1.5 longer than prothorax, without conspicuous markings, flattened in front, cheeks slightly arched. Postocular spines fully as long as eyes, with dilated tips. Eyes moderately small. Ocelli present. Mouth cone short, extending two-thirds over prosternum. Antenna about 1.5 longer than head, all segments rather compact, segment three noticeably " V "-shaped, three to seven each with a pedicel, eight broadly and flatly joined to seven.

Prothorax only slightly wider than head, all normal spines, including those on anterior margins and mid-laterals present, with dilated tips. Sides of pterothorax narrowed posteriorly. Legs short, fore femora slightly thickened, fore tarsi apparently unarmed. Wings reduced to short pads. Abdomen long and slender, wing-holding-spines completely wanting. Tube .66 head's length. Spines on ninth and tenth segments 1.5 longer than two.

Type Material: Female holotype, one female paratype taken under Maple bark, April 5, 1926, by Mr. J. W. Gilmore. Types in author's collection. (Moulton, No. 1428.)

Type Locality: Clarksville, Tennessee.

This species is closely related to *C. errans* Moulton, but may be separated by the lighter and more yellowish color, the shorter and narrower fourth and fifth antennal segments and the smaller fore femora.

Thorybothrips yuccae n. sp.

Female, holotype: Body color uniformly dark brown; Legs and all segments of antenna dark brown except base of third which is lighter. Wings transparent, prominent body spines whitish.

Total body length (abdomen normal) 2.0 mm.; head, length .266 mm., width behind eyes .166 mm., at posterior margin .20 mm.; prothorax, length .133 mm., width including coxae .383 mm.; pterothorax, width .366 mm.; tube, length .195 mm., width at base .081 mm., at tip .042 mm. Segments of antennae: length (width) I, 36 (36); II, 51 (36); III, 60 (39); IV, 60 (39); V, 54 (33); VI, 51 (30); VII, 60 (24); VIII, 54 (15); total length 410 microns.

Length of spines: postoculars 70 μ, on anterior angles of prothorax 30 μ, outer pair on posterior angles, 75 μ, on ninth abdominal segment 156 μ, on tip of tube 120 microns.

Head 1.3 longer than wide, narrowest across eyes, cheeks straight, diverging toward posterior margin where head is broadest, without conspicuous markings. Postocular spines long, with blunt tips, placed near sides and almost mid-way between posterior margin of eyes and posterior margin of head, other spines inconspicuous. Eyes not protruding, outer margin almost straight and joining cheeks evenly, occupying about .3 the head's length. Ocelli fully developed. Mouth cone short and broadly rounded, reaching two-thirds over prosternum. Antenna with eight segments, three to seven each with a distinct pedicel, three and four broadly clavate, subequal in length and width and broadest of all, eight more than three times as long as greatest width, clearly separated from seven, narrowed at base but without a distinct pedicel. Sense cones short and strong, segments three and four each with three and five and six each with two.

Prothorax .66 as long as head, clearly transverse, without conspicous markings. Spines on anterior angles moderately developed with blunt tips, a prominent pair at each posterior angle, others vestigial. Pterothorax slightly narrower than prothorax including coxae, broadest in front with sides gradually converging toward the posterior. Fore femora greatly enlarged with outer distal margin slightly curved outward as in *Chirothrips manicatus,* Hal., fore tibia stout, each fore tarsus armed with a short, stout tooth in addition to a strong claw. Middle and hind legs moderately long. Wings fully developed, with parallel sides, fore pair with twenty double fringe hairs along posterior margin.

Abdomen normal. Tube .7 as long as head and twice as broad at base as at tip. Abdominal spines well developed but difficult to see because of their whitish color.

Type Material: Female holotype taken on *Yucca rupicola,* April 25, 1928, by Mr. Hugh H. Duval. Type in author's collection. (Moulton, No. 3242.)

Type Locality: Bastrop, Texas.

This species is interesting as it is the first member of the genus to be found in North America. It is easily distinguished by its uniformly dark brown antennae and legs in comparison with the European *T. graminis,* Priesner, which has the end of the fore tibiae and tarsi and the third antennal segment yellowish to yellowish gray.

Rhynchothrips versicolor n. sp.

Female, holotype. Body color dark chestnut brown except all tarsi which are yellowish, and third antennal segment which is yellow with a cloud of grayish brown in outer half, segments four to six mottled with yellow, all prominent body spines dark brown. Wings transparent except for a light brownish cloud at base.

Total body length 2.12 mm.; head, length .266 mm., width .233 mm.; prothorax, length .216 mm., width (without coxae) .333 mm., (including coxae) .383 mm.; pterothorax, width .433 mm.; abdomen, width .433 mm.; tube, length .25 mm., width at base .083 mm. Segments of antennaae: length (width) I, 39; II, 60 (36); III, 81 (36); IV, 81 (39); V, 69 (39); VI, 60 (33); VII, 48 (30); VIII, 36; total length 510 microns. Length of spines: postoculars 69 μ, on anterior margin of prothorax 60 μ, on anterior angles 48 μ, midlaterals 75 μ, on posterior angles, outer 150 μ, inner 135 μ, on ninth abdominal segment 210 μ, on tip of tube 210 microns.

Head 1.3 longer than width behind eyes, broadly flattened in front, cheeks slightly arched, somewhat narrowed toward the posterior, marked with transverse, wavy, anastomosing lines. Postocular spines stout, pointed, somewhat shorter than length of eyes. Eyes large and round. Ocelli well developed. Mouth cone stout, pointed, reaching to anterior margin of mesosternum. Antenna with segment eight clearly separated from seven but broadly joined. Sense area on segment two placed about one-third the segment's length from distal margin.

Prothorax transverse, .7 as long as head, sculpturing more or less distinct only at the sides. All normal spines well developed and with pointed tips, pair at posterior angles longest. Pterothorax with evenly formed and slightly arched sides. Legs moderately stout, fore femora somewhat thickened, fore tarsus with the usual claw, otherwise unarmed. Wings fully developed with parallel sides, each fore wing with 16 double fringe hairs along the posterior margin.

Abdomen of equal width with pterothorax. Tube .9 as long as head.

Both larvae and pupae have much dark red or purple pigment.

Type Material: Female holotype, one female paratype, three large larvae and four pupae taken in hickory galls June 22, 1927, by Mr. J. W. Gilmore. Types in author's collection. (Moulton, No. 2093.)

Type Locality: Appomatox, Virginia.

This species most closely resembles *R. ilex*, Moulton, but is distinguished by the lighter fourth and fifth antennal segments which are mottled in effect rather than shading gradually from yellow to yellowish brown as in *ilex*. This species also has longer third and fourth antennal segments, 81 μ as compared with 60 μ in *ilex* and a larger number of double fringe hairs on fore wings, 16 as compared with 8–10.

Lispothrips varicornis n. sp.

Female, holotype. Body color black, legs black except tarsi which are dark brown. Antennal segments one, two and six to eight almost black, two lighter at tip, three and four yellow with four slightly brownish in distal third, segment five deep brown with pedicel lighter.

Total body length 2.16 mm. (abdomen distended); head, length .219 mm., width .18 mm.; prothorax, length .18 mm., width .276 mm.; pterothorax, length .18 mm., width .33 mm.; abdomen, width .48 mm.; tube, length .165 mm. width at base .075 mm. Segments of antennae: length (width) I, 30 (36); II, 48 (36); III, 42 (30); IV, 45 (36); V, 42 (33); VI, 45 (28); VII, 48 (24); VIII, 36, total length 330 microns. Length of spines: postoculars 45 μ, on anterior angles of prothorax 30 μ, mid-laterals 33 μ, on posterior angles, outer 60 μ, inner 30 μ, on ninth abdominal segment 75 μ, at tip of tube 90 microns.

This species is typical of the genus with its short, compact antennae, segments three to seven each having a broad, distinct pedicel, segment three without sense cones, checks roughened and with three or four short, sharp transparent spines borne on small warts. The regular body spines are short, transparent and difficult to observe. Legs are short and stout.

It is easily separated from *L. birdi*, Moulton, by the following characters: Antennal segments three and four yellow, head more slender, with cheeks almost parallel and slightly constricted at base, mouth cone distinctly longer and more angular at tip, reaching two-thirds across prosternum.

Type Material: Female holotype taken on Black Willow (*Salix nigra*), April 17, 1927, by Mr. F. C. Bishopp. All types in author's collection. (Moulton, No. 2175.)

Type Locality: Menard Texas.

Only two species in this genus have been recognized up to this time and both are European, therefore it is interesting to record one new species in this paper and two others which are being described elsewhere, as new North American species.

Gynaikothrips uzeli Zimmermann.

One female and two male specimens taken on Red clover, September 3, 1927, at Atwater, Illinois, by Miss L. Blevins. (Moulton, No. 2317.)

This is an interesting record because it extends the distribution of the species much farther north than it has heretofore been known.

Hoplothrips kincaidi n. sp.

Female, holotype. Color including antennae and legs uniformly light brownish yellow except tube which is more distinctly yellow.

Total body length 2.16 mm.; head, length .233 mm., width .233 mm.; prothorax, length, .189 mm., width .36 mm.; pterothorax, width .38 mm.; abdomen, width .466 mm.; tube, length .183 mm. Distance between basal segments of antenna 15 m. Segments of antennae: length (width) I, 54 (48); II, 60 (39); III, 66 (42); IV, 66 (39); V, 66 (42); VII, 54 (33); VIII, 69 (24); total length 486 microns. Length of spines: postoculars 105 m., on anterior angles of prothorax 63 μ, mid-laterals 36 μ, on posterior angles, outer 150 μ, inner 69 μ, on ninth abdominal segment 240 μ, at tip of tube 180 microns.

Head as wide as long, cheeks straight, slightly diverging posteriorly and broadest near posterior margin. Postocular spines almost half as long as head, sharply pointed like other prominent body bristles. Eyes extremely small with less than ten facets and only two on outer margin. Ocelli wanting. Mouth cone broadly rounded, labrum sharply pointed, reaching posterior margin of prosternum. Antennae 2.1 longer than head, segment eight with broad pedicel and clearly separated from seven.

Prothorax .8 as long as head and nearly twice as wide as median dorsal length of pronotum. Anterior marginal spines vestigial, those at anterior angles about half as long as outer pair at posterior margins. Legs moderately short, fore femora slightly thickened, each fore tarsus armed with a small tooth in addition to the usual claw. Wings wanting.

Abdomen somewhat broader than thorax. Tube .8 as long as head, clearly broader at base and narrowed in distal fourth.

Larvae clear to grayish white with tube somewhat darker.

Type Material: Female holotype, 5 female paratypes and two larvae taken under bark, November 1, 1927, by Mr. T. Kincaid after whom the species is named. Types in author's collection. (Moulton, No. 2572.)

Type Locality: Seabeek, Washington.

This species is closely related to *pedicularis,* Haliday from which it may be distinguished by its uniformly lighter color and by the whiter color of larvae. It may also be distinguished from *pergandei,* Hood by the sharply pointed body bristles. In *pergandei* these bristles have dilated tips.

Tribe *Docessissophothripini* Priessner, 1927.

Docessissophothrips* animus n. sp.

Male holotype. Color dark brown with head and tip of abdomen beyond seventh segment blackish. All legs and segments of antennae dark brown except basal two-thirds of three which is yellowish.

Total body length 3.32 mm.; head, length .54 mm., width .33 mm.; prothorax, length .12 mm., width including coxae .48 mm.; pterothorax, width .57 mm.; abdomen, width .57 mm.; tube, length .33 mm., width at base .12 mm., at tip .06 mm. Segments of antennae: length (width) I, 27 (45); II, 75 (48–60); III, 135 (42); IV, 105 (45); V, 108 (42); VI, 87 (45); VII, 51 (36); VIII, 63 (24); total length 660 microns. Length of spines: group of ante- and postocellar spines 99–120 μ, postoculars 90 μ (?), on posterior angles of prothorax, outer 120 μ, inner 90 μ, basal wing spines 60, 60 and 120 μ respectively, on ninth abdominal segment 240 μ, tip of tube 180 microns.

Head 1.7 longer than wide, smaller in front, swollen and elevated in the middle and somewhat reduced toward the posterior margin, with a pair of prominent spines on either side in front of each posterior ocellus, the inner one of which is almost in line between the posterior ocelli and the anterior ocellus and the outer one close to inner margin of eyes. There is also a smaller pair almost immediately behind and a little inward from posterior ocelli. The postocular spines are placed well back from eyes with a similar pair near median dorsal part of head, cheek spines small and inconspicuous. Eyes semi-crescent shaped around anterior angles of head, with small facets. Ocelli large, anterior ocellus directed forward, posterior ocelli approximate to inner posterior angles

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* (Docessissopho = conceited, referring to the swollen head.)

of eyes. Mouth cone short and broadly rounded. Maxillary palpus with two segments, the distal segment with two short, sharp, spur-like spines, one at the extreme tip and one on the inner margin near tip, in addition there are several longer normal spines. The terminal segments of each labial palpus are also tipped with a pair of prominent spurs in addition to other normal spines. Larger maxillary stylus narrow, lanceolate, pointed and grooved. Antenna 1.16 longer than head, segment two normal in dorsal view but in side view rather broadly expanded on the inside near the middle and toward tip, segments six and seven normal in dorsal view but swollen and projecting on ventral side at tips and set with three or four prominent spines; segments six to eight clearly separated, each with a distinct pedicel. Sense cones short and pointed.

Prothorax .2 as long as head and four times as wide as long, deeply concave in front. All normal spines present, sharply pointed like other prominent head and body spines. Pterothorax with sides rather evenly formed and almost parallel. Fore femora only slightly larger than middle and hind femora. Fore tarsi unarmed. Wings fully developed, broad with parallel sides but moderately short, extending only to sixth abdominal segment, fore-pair with 18 double fringe hairs along posterior margin.

Abdomen from segments two to five about as wide as pterothorax, reduced gradually beyond the sixth. Tube .6 as long as head and three times as long as width at base, ninth segment extends back on either side, forming distinct scales over basal third of tube. Sixth abdominal segment with a pair of tube-like inwardly curved appendages which extend to beyond middle of segment seven.

Female allotype. Colored as in the male.

Total body length 2.86 mm.; head, length .60 mm., width .39 mm.; prothorax, length .15 mm.; width .51 mm.; pterothorax width .60 mm.; abdomen, width .69 mm.; tube, length .45 mm., width at base .11 mm. Segments of antennae: length (width) I, 60 (52); II, 75 (dorsal view 51, side view 75); III, 165 (49); IV, 135 (49); V, 120 (45). Length of spines: interocellar spines 120 μ, on ninth abdominal segment 330 μ, at tip of tube 240 microns.

Tube .7 as long as head.

Type Material: Male holotype taken July 11, 1925, by the writer while sweeping nettles in the hills above Mt. View, California (Moulton, No. 402), and female paratype taken by Mr. J. C.

Bridwell at Corvallis, Oregon, host plant and date not given. Types in author's collection. (Moulton, No. 249.)

Type Locality: Mt. View, California.

This species appears to be most closely related to *D. adiaphorus* Karny but is easily separated by its color, the latter having all tibiae and tarsi clear yellow. All the species of this genus have heretofore been recognized by individual female specimens and the finding of a male which has tube-like appendages on the sixth abdominal segment is extremely interesting because it removes this genus from the subfamily *Phloeothripinae,* Tribe *Docessissophothripini* (according to Dr. H. Priesner's Monograph of the Thysanoptera of Europe, 1926, p. 478), and places it clearly in the subfamily *Megathripinae,* Tribe *Megathripini.* After measuring the female paratype I demounted and dissected this specimen to observe the mouth parts and found the larger maxillary stylus clearly grooved, but unfortunately the second smaller organ was lost in the dissection.

The species is also close to *Siphonothrips elegans* Buffa but the shape of the head and eyes would seem to place it rather in the genus *Docessissophothrips.*

Paonias excaecatus in Colorado.—During the past summer a fine female *P. excaecatus* was taken at Boulder, Colorado. I was interested to see if it could be referred to the pale western race (*pecosensis* Ckll.) which I described (Entomologist, April, 1905) from New Mexico. Allowing for a reasonable amount of variation, I think it may be considered *pecosensis,* as it has the upper part of the dark median area pale and rosy, with the black spot very conspicuous, and the dark lines on the basal field are barely perceptible. The light post median bands are suffused and very obscure. The ocellus on hind wing is large and oblong, not circular, with the pale blue pupil comparatively large and transverse. In the case of *Automeris io,* Barnes and Benjamin distinguish a Colorado race, and a distinct one in New Mexico. It is quite possible that there are similarly two races of *P. excaecatus,* but it would be hazardous to affirm this without more material. Undoubtedly these sphingids produce local races under diverse climatic conditions, but these can only be adequately demonstrated by large series, which will only be obtained by breeding.—T. D. A. Cockerell, Boulder, Colo.

SOME COMMON DIPTERA AND THEIR HABITS.

By N. K. Bigelow, Staten Island, N. Y.

The order Diptera is divided into two groups or suborders known as the Orthorrhapha and Cyclorrhapha. In the members of the first group the pupa is free but in those of the second it is known as a puparium being enclosed in a hard, seed-like capsule formed from the larval skin.

Many species of Orthorrhapha are aquatic in their early stages and the structure of their larvae and pupae shows many striking adaptations to their life in an aquaeus environment.

The larvae of a great many species of Chironomid midges live in the ooze at the bottom of ponds, streams and lakes.

For creeping about through the ooze and vegetation they are provided with two pairs of pseudopods. One pair is on the under side of the thorax and the other at the extremity of the insect's abdomen and these organs are covered with numerous hooks.

The species which live in the ooze have an abundance of the red pigment haemoglobin which is of great use in absorbing oxygen but those which live above the ooze usually lack this pigment.

The pupae of bottom-living species have two tufts of filamentous gills while the others bear respiratory trumpets and must come to the surface for air. In both instances the adult flies are structurally almost identical.

The larvae of the *Simulium* or black fly is admirably fitted for life in the swift currents where they cling to the under side of stones and logs.

On each side of the head this larva bears a pair of ear-like organs each of which has about fifty long thread-like hairs which are used as a net to catch small organisms for food as they float by in the current.

A pair of pseudopods on the thorax and a pair on the abdomen have been shortened, have united and formed into the powerful sucking discs for clinging to the rocks.

The *Simulium* pupae have two tufts of filamentous gills and cling to the rocks. Upon emergence the imago reaches the surface enclosed in a bubble of air secreted by the pupa.

The *Corethra* or ghost larva is a modified type of the mosquito larva, being fitted for a predaceous life in the open water.

It is extremely transparent. The mandibles are armed with long pointed teeth while the antennae are jointed at their base, armed with stiff bristles and used in grasping and holding their prey.

For the purpose of flotation there are two large bean-shaped air sacs in the thorax and another pair in the seventh abdominal segment.

Apart from their biological interest these various larvae are of great economic importance.

Chironomid larvae are used as food by a great many species of fishes. It has been estimated that at Lake Nipigon they occur in such numbers that there is at least one hundred pounds of them to every acre of lake bottom and they form at least 35 per cent. of the food of the white fish. They are equally abundant in other bodies of water.

ISTURGIA TRUNCATARIA IN LONG ISLAND.

By Roy Latham, Orient, L. I., N. Y.

As *Isturgia truncataria* Walker is not listed from Long Island in "A List of the Insects of New York," I would like to record the collection by myself, in 1928, of several specimens from Manorville.

In a small pine barren swamp with a heavy low growth of the leather-leaf, *Chamaedaphne calyculata* L. on July 4 I saw eight of these moths. It was in the late afternoon. A thunder-storm was passing on the north and the air was sultry. The bottom of the depression contained no water on that date. In tramping about the insects would leave the shelter of the *Chamaedaphne* shrubs and fly strongly across the swamp about two hundred feet and alight. Four were captured on that date.

On July 10 I again visited the locality and saw approximately thirty of the moths and took several. A week later I took observations at the swamp and several times thereafter during the season but no individuals of this species were seen after July 10th.

In the dry sandy soil of the pine barrens above the bank of the swamp I found the locally rare plant *Pyrola clorantha* Sw. not uncommon. It was the second record for this species from Long Island. It had been reported from near Riverhead many years ago. Later in 1928 I also collected this plant from the sandy barrens at Napeague.

A NEW SPECIES OF GYRINUS FROM NORTHERN NEW HAMPSHIRE.

By K. F. Chamberlain, Assistant Entomologist, New York State Museum.

The following species of Gyrinus from the Connecticut Lakes region of northern New Hampshire is herewith described as new. I take great pleasure in dedicating this species to my friend, Dr. J. G. Gehring, of Bethel, Maine.

Gyrinus gehringi n. sp.

Form broadly oval, moderately convex, color above black, shining, with some bluish reflections; sides of the elytra, prothorax and head, the sutural margin, the labrum and clypeus conspicuously bronzed; the bronzed portion of the elytra extending to and rather sharply limited by the eighth stria. Sutural stria consisting of a series of rather fine punctures; the punctures of the succeeding striae becoming progressively larger towards the sides so that those of the eighth to eleventh striae are conspicuously coarser. Eleventh stria quite close to the margin, almost marginal at base and towards the apex, slightly distant medially; eighth and ninth striae slightly impressed at the base. Prothoracic and elytral margins broad, horizontal.

Elytral surface highly polished and with an exceedingly fine alutaceous sculpture together with a very minute micropunctulation which can only be seen under a high power magnification. The punctulation is somewhat more evident in the female, becoming extremely sparse and almost obsolete in the male.

Color beneath, including the epipleurae and hypomera, uniformly rufo-testaceous.

Male genitalia—rufo-testaceous throughout; median lobe, when viewed from above, triangular, one fifth broader at the base than the lateral lobes, rather rapidly, evenly and arcuately narrowed from base to apex which is acute; there is a broad, deep, angular dorsal channel extending from the base almost to the extreme tip and the ventral surface is angularly carinate or roof-shaped thus causing the median lobe to appear like the letter "V" in cross section. There is a further peculiar modification in the remarkable lateral apical compression so that, when viewed from the side, the median lobe at the tip is about one half as wide dorso-ventrally as its greatest lateral width. At some distance before the apex the ventral carina becomes compressed and more acute so that an ante-apical cross section would appear somewhat "Y" shaped.

The sexes are quite similar; the female is somewhat larger and more robust and has the micro-punctulation of the elytra more pronounced as noted above.

Length, Male 5.5 mm. Width, 3.2 mm.
Length, Female 6.2 mm. Width, 3.5 mm.

Measurements taken from the anterior margin of the head to the elytral apex.

Holotype, Male; Moose Pond, Pittsburg, New Hampshire, August 15th, 1925. Collected by the author.

Allotype, Female; Collected with the male.

The types are deposited in the author's collection.

This species, having the eleventh elytral stria close to the margin, larger size (exceeding 5 mm.) highly polished surface and uniform color beneath, would fall between the alternatives of couplet thirteen of Dr. Fall's paper.[1] While the uniform coloration of the ventral surface would refer it to the *pulicifer* section, all of the other affinities of this species are obviously of the *aquiris-lecontei* type. From *aquiris* it may be separated by its larger size and more robust form and by the male genitalia which are of an entirely different type. The only species with which it might easily be confused is *Gyrinus lecontei* Fall which it most closely resembles in general form and appearance. The sculpture of the elytra is practically the same. The present species, however, is somewhat larger than the average specimens of *lecontei* and has the lateral margins distinctly more bronzed and the punctures of the lateral striae somewhat coarser. The most striking difference, however, is exhibited in the structure of the male genitalia which is quite unique and not closely approached by any other species of the genus. The rapidly narrowed, triangular form of the middle lobe together with the broad, lateral compression of the tip will at once serve to distinguish it. This lateral compression is also exhibited in the male genitalia of *lugens* and *maculiventris* but to a much less degree, while in *lecontei* the middle lobe is only very slightly compressed apically. Moreover, in *lecontei* the male genitalia are distinctly piceous towards the apex while the coloration in the present species is uniform throughout.

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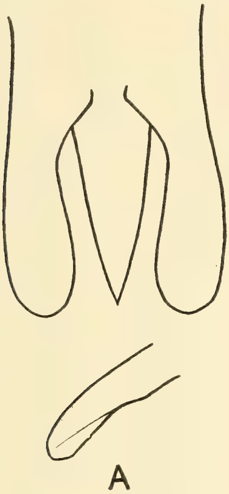
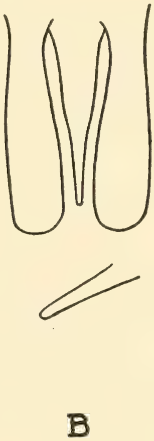
[1] Trans. Am. Ent. Soc. XLVII, p. 269–306.

The accompanying figure gives a comparison of the male genitalia of *Gyrinus gehringi* n. sp. and *Gyrinus lecontei* Fall.





A—Gyrinus gehringi n. sp.
Upper: Dorsal View of Male Genitalia.
Lower: Lateral View of Middle Lobe.

B—Gyrinus lecontei Fall.
Upper: Dorsal View of Male Genitalia.
Lower: Lateral View of Middle Lobe.

A Synonym.—I very much regret having to record that *Cantharis andersoni Frost* is, in all probability, a synonym of *C. livida L.* Before its description specimens were sent to Europe and a report received that they were unknown. The occurrence of this insect in increasing numbers about Boston induced me to send some specimens to Mr. Georg Ochs of Frankfort, Germany. He very kindly submitted them to Mr. Hubenthal who has reported that he could find no difference between them and the European species of Linné.—C. A. Frost, Framingham, Mass.

BOOK NOTES

The Principles of Systematic Entomology, by Gordon Floy Ferris. (Stanford University Publications. University Series. Biological Sciences. Volume V, number 2, pp. 103–269, figs. 1–11) Stanford University Press. (Paper, $2; cloth, $2.75.)

Entomology as a science has long passed its embryonic stage; its infancy comes to a close; and as it nears its adult state, it is taking stock of itself, defining its underlying principles and remaking its practices. When it was a child, it spoke as a child; now it is putting away childish things. Indeed, my personal sympathy is with that attitude of mind of those entomologists of today who would restrict the practice of the science to those technically trained. The irresponsibility of the adolescent science and its unlicked condition are certainly exasperating. Dr. Ferris is numbered among those who are making the toga to clothe the adult form.

It is within the experience of every serious worker to find himself entirely at a loss before the extremely loose methods of men who have produced new studies, principally in taxonomy. Indeed, it is necessary in many instances to be familiar with the primitive methods of work in the privacy of his cabinet in order to arrive at an approximate idea of what some authority's recondite description is intended to convey. But it is also true that the *auctores vetustiores* did not enjoy the instruments of precision now in our hands; nor did they know the refinements of technique produced by secular trial and error methods until only the best remains. Yet the formative period which produced a Walker also gave us a Say. So, perhaps, the man is more than the instrument and the technique.

Dr. Ferris' work under discussion deserves an extended and critical commentary, which our space available does not permit. The author says: "This volume is a frankly critical survey of the existing conditions in systematic entomology. . . . It (entomology) will demand of its followers a training as thorough and as rigid and scientific standards as high as are required in any other profession. At the present time, however, it is a curious combination of two things, a profession and a hobby of dilettantes." This last sentence is, of course, true. But we must remember that entomology is two things: an art as well as a science. As an art, any one with a call may practice it; as a science, the scientific outlook is necessary, with all that that spirit implies.

And there is also a border-land, principally in ecology and other field work, where the two aspects blend in a curious manner. Without the collector, the dilettante, if you please, where would would we get much of the material objects of our study? Who would furnish the raw stuff of our biology? The sculptor would find himself quite at a loss without the quarryman who gets out the block of marble; and who perhaps is the only one capable to get out the flawless piece and to recognize it.

Of course, the remedy for crude work in systematic entomology at bottom rests in the hands of the editors of the journals of entomology. But no known means of control appears above the horizon to keep the commercial publisher within acceptable technical limits. He will publish anything that will sell; but nothing not profitably marketable, no matter how high its technical quality or how important from the scientific point of view. Here we have one source of unacceptable work.

Now, in order to enforce *any* standards, we must have such standards established as will appeal to the consensus of informed technical opinion to be reasonable and true; and there must be some body with authority to define these standards and to enforce them—and, of course, some inspired or all-powerful interpreter.

It is feasible always to define what shall constitute a valid description, under the authority of some adequate commission appointed by a plenary zoological congress. But we must always have clearly before us that the irreducible limit and form set for one series of categories may be entirely unfit for another. Need we more than mention that in Lepidoptera color may serve to delimit a species, but not so in Coleoptera or in Heteroptera? It is also possible that a positive restriction be imposed as to officially recognized technical organs in which valid—or rather, accepted—descriptions may appear. These journals need not be named, but they may be accurately defined. For example, no one would seriously consider a daily newspaper as the place in which to look for, still less to publish, a taxonomic study of any kind. Neither should one be compelled to look for a new species of insect in a botanical treatise or journal. No difficulty would arise from restricting valid insect descriptions to purely entomological journals published under the auspices of societies; or to similar journals on general zoology. But all other journals should be relentlessly barred. General treatises on entomology, of course, should be available organs for taxonomic discussion. Publications by institutions and by various government agencies also would be proper places for publication on taxonomy. But there is a border line about which flit books of travel, botanical and ecological journals, medical journals, general works, and general books on zoology at large. These should be strictly barred as sources and all work on systematic entomology appearing in them should be invalid *ab ovo.*

Naturally, such journals as indicated above to be acceptable, in the normal order of things, would be under the direction of competent men; and such men could be trusted to proceed under the rules. But unless books of travel are barred, we will be at the mercy of adventitious taxonomic work, such as appeared in Whymper's "Great Andes of Peru," a work not known among entomologists; and the very last place one would look in for descriptions of insects.

The entire twelve chapters of the "Principles" deserve a careful critique—in fact, the work as a whole is so provocative of thought that it should be the subject of a careful and thorough analysis and criticism (in the best sense of that word). Chapter XII, on "The Training of the Systematist," we will consider here more at length, because it is really the fundamental chapter, to which all the others lead up. Its opening paragraph thus states its thesis: "The doing of all these things which are involved in the work of the systematist is a technical task which should be undertaken only by those who are technically trained for its accomplishment. The acquirement of this technical training should be considered essential for any one who wishes to be called a systematist."

It is true, as Dr. Ferris states, that "systematic work in general has admitted the untrained worker to a position of parity with others." How could this have been avoided in the beginning? Who was trained then? The most honored in America, beginning with Thomas Say, were self-trained; and at the beginning, very untrained. There are, of course, contemporaneous fossils among the entomologists of today; there are also those whose descriptive work *seems* erudite, until you test it in practice. And some of these latter are presumably trained men!

True it is that the technical worker should know how to prepare his material; yet, there are graduates who are incapable of mounting an insect correctly. He should also know how to use his material to the best advantage, and also the technique of adequate and proper examination of specimens. He should likewise be fully alive to the outstanding fact that each group is unique; and that the descriptive technique applicable for one may be entirely useless for another. In other words, a set of characters that may adequately define species in one group, large or small, will be absolutely misleading or unavailable in another.

The principle of a thorough acquaintance with the literature, is so obvious that it need not have been mentioned; but some men are unable to see the woods for the trees, so it is well to speak of it pointedly.

And as to the matter of saving wear and tear of editorial brain cells by proper preparation of papers, see this BULLETIN, vol. xxiv, pp. 15–19; and other papers by the same author.

It is also true, and must be emphasized again and again, that acquaintance with one fauna, however extensive it may be, is extremely inadequate preparation for monographic work. Whatever the group, it should be collected and studied world wide.

Yet, this chapter seems to me to have a serious omission. Nowhere in it is mention made of the inescapable necessity of a good acquaintance with any language other than English. Every time I meet a work in Russian, Japanese, Czecho-Slovak, or any other of these languages so alien to Western Europe, I rejoice that the author has been so considerate as to put some part of it into Latin, German or French. These last three languages indeed are indispensable to the entomologist of English speech. How can one understand Fabricius or Horváth without Latin? Or Handlirsch without German? Or Oberthür without French? But Latin goes further than this: it is the key to a great group of languages—Spanish, Portuguese, Italian, Rumanian. How can any entomologist, no matter how competent otherwise he may be, be fully fitted to refer to the original sources and fundamental works and evaluate their contents, if he has not this sharpened mental tool of languages?

And here we leave this informing essay, which every entomologist who does original taxonomic work, be he an adept or a novice, should possess, con, and ponder.—J. R. T. B.

N. B.—Dr. Ferris asks that attention be drawn to the following corrections, overlooked in the proof: Fig. 8, L, should read "first abdominal," *not* " metathoracic " spiracle; on p. 116 the formula for the geometrical progression should have + signs throughout instead of –; and in the graph, fig. 11, the words " Genera " and " Species " should be transposed.

PROCEEDINGS OF THE SOCIETY.

Meeting of January 10th, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday evening, January 10, 1929, at 8.25 p. m.

President Davis in the Chair and eleven members present, viz: Messrs. Anderson, Bell, Beutenmuller, Bigelow, Engelhardt, Hunter, Lemmer, Notman, Schaeffer, Schiffer, Sheridan, Siepmann; one visitor, Mr. C. L. Pollard, and three reporters.

Minutes of the previous meeting were read and approved.

Mr. Engelhardt then presented the report of the Treasurer for the past year. He commented on the very favorable financial condition of the Society.

On account of the illness of Mr. Torre-Bueno, the report of the Publication Committee was postponed until the February meeting.

Mr. Davis proposed for membership: Mr. N. K. Bigelow, c/o Staten Island Museum, New Brighton, Staten Island, New York.

As Mr. Bigelow was present, it was regularly moved and seconded that the By-Laws be suspended and that the Secretary cast one ballot in favor of the election of Mr. Bigelow, which was done and Mr. Bigelow was declared duly elected a member of the Society.

Mr. Sheridan as Chairman of the Nominating Committee, presented the following ticket for officers of the Society for the ensuing year:

President, Mr. W. T. Davis.
Vice-President and Editor, Mr. J. R. de la Torre-Bueno.
Treasurer, Mr. Geo. P. Engelhardt.
Secretary, Mr. E. L. Bell.
Delegate to Academy, Mr. G. P. Engelhardt.
Librarian, Dr. Jos. Bequaert.
Curator, Mr. F. M. Schott.
Corresponding Secretary, Mr. H. Notman.
Publication Committee { Mr. J. R. de la Torre-Bueno
Mr. G. P. Engelhardt
Mr. E. L. Bell.

Mr. Davis remarked that Mr. Schott had resigned from membership in the Society, on account of removal of his residence from the City; Mr. J. M. Sheridan was then proposed for

Curator; there being no further nominations, they were declared to be closed and the Secretary directed to cast one ballot for the ticket as amended, which was done and they duly declared to be elected.

Mr. Bigelow showed a box containing two flies captured on a window in the Staten Island Museum, on January 3rd, 1929, and said that they were species that came under the general term of "house flies"; the larger one being *Pollenia rudis* Fabricius, known as the Clusterfly, a European species, introduced into this country some time ago, the exact date being uncertain, but it has been known to be here since 1864; it is obnoxious for the reason that although it is an outdoors fly, it hibernates in houses during the fall and winter months and congregates in numbers in out of the way places; it is believed by some to breed in decomposed matter, but the chief opinion is that it is an earthworm parasite; it is more annoying than dangerous as it does not carry disease; the smaller fly, *Fannia scalaris* Fabricius, is a dangerous species as it flies from filth direct to food.

Mr. Davis showed a remarkable aberration of *Junonia coenia* and read an account of it, his paper on this butterfly will be later published in full. (See the February number of this *Bulletin*).

Mr. Notman showed three boxes of beautifully prepared specimens of Coleoptera collected by him in Northern California and presented his paper "Coleoptera from Northern California." (Printed in this number).

Mr. Torre-Bueno's paper, "The Editor's Joys and Woes," was postponed until the February meeting.

Meeting adjourned at 10.15 p. m.

MEETING OF FEBRUARY 14, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday evening, February 14, 1929, at 8.20 p. m.

President Davis in the Chair and 13 members present, viz. Messrs. Bell, Bigelow, Engelhardt, Hunter, Lemmer, Nelson, Notman, Schaeffer, Sever, Sheridan, Siepmann, Willis, Dr. Marker, and two reporters.

Minutes of the previous meeting read and approved.

Mr. Engelhardt presented the monthly report of the Treasurer.

Mr. Engelhardt read a letter from Miss Frances W. Calder, daughter of Prof. Edwin E. Calder, of Providence, R. I., one of the active members of the Society who died on January 16, and said that Professor Calder was a specialist in tiger-beetles. He also mentioned personal incidents in his acquaintance with Prof. Calder.

Mr. Engelhardt also brought to the attention of the Society, the death of Mr. Jacob Doll, on February 10, at the age of 82. At the time of his death Mr. Doll was an honorary member of the Society but he said that Mr. Doll was one of the Charter members of the Society, and had been a Curator at the Brooklyn Museum for 27 years, retiring two years ago at the age of 80. He spoke of the skill with which Mr. Doll mounted insects and reviewed many interesting incidents connected with him. He recommended the publication in the April BULLETIN, of his paper published in the Brooklyn Museum Quarterly "Chapters from the Long Life of a Butterfly Collector" which contains a picture of Mr. Doll, and the addition of further chapters to bring it up to date. The Secretary was directed to write to Mrs. Doll and convey to her the sympathy of the Society.

Mr. Engelhardt also reported the death of Mr. Funk, a former member of the Society, during the fall of 1928.

Mr. Davis spoke of the death of Dr. Harrison G. Dyar and his important work in the classification of Lepidoptera and his work during later years with mosquitos.

Mr. Davis also spoke of the death of Colonel Wirt Robinson, a close personal friend; and showed a photograph album containing pictures of the Colonel and many scenes about his home at Wingina, Virginia, and nearby places where they had spent much time together in collecting during past years; he read an account the achievements of Colonel Robinson as a soldier and as a professor at West Point and other places. He also showed a box of wasps recently sent to him by Colonel Robinson for identification.

Mr. Bigelow presented his very interesting paper on "Some Common Diptera and their Habits."

Mr. Bigelow's paper was discussed by the members.

Adjourned at 10.00 p. m.

MEETING OF MARCH 14, 1929.

A regular meeting of the Brooklyn Entomological Society was held in the Brooklyn Museum, on March 14, 1929, at 8.20 p. m. President Davis in the Chair and 8 members present, *viz.:* Messrs. Bell, Bigelow, Lemmer, Nelson, Schaeffer, Shoemaker, Siepman and Torre-Bueno, also two visitors, Mr. C. L. Pollard and Miss Blandar.

Minutes of the previous meeting read and approved.

Mr. Engelhardt being absent, there was no report of the Treasurer.

Mr. Torre-Bueno presented the report of the Publication Committee for 1928; he commented on the notable growth of the BULLETIN since the resumption of its publication in 1912, at which time there were some 80 subscribers, most of whom were members, and the price to non-members was 75 cents, while at present there are 278 subscribers and the price to non-members is $2.50. At the October meeting in 1912 the Treasurer reported a cash balance of $508.70 in the combined Society and BULLETIN accounts, whereas at the October meeting in 1928, these two accounts showed a balance of about $1,800.00; the income from subscriptions amounts to approximately $675.00, while the cost of publication is about $800.00, but the sale of reprints and back numbers makes up this shortage. However, he made his usual plea that the members endeavor to obtain new subscribers who will stick. He reported a net increase for the year of one subscriber. He also commented on the high character of the contributors. He reported on *Entomologica Americana* that the subscription list still remained at about 130, and that its publication was progressing favorably.

Mr. Davis commented on the very favorable character of the report and thanked Mr. Torre-Bueno, for the Society, on the gratifying results due so largely to his efforts.

Mr. Torre-Bueno read communications from Prof. Cockerell in regard to "What is an Editor for?" and his replies thereto.

Mr. Bell read a letter from Mr. Geo. P. Engelhardt and Mr. J. R. de la Torre-Bueno in which they presented to the Society for election to Honorary Membership the following prominent entomologists:

Professor M. N. Rimsky-Korsakov,
Forest Institute, University of Leningrad.
Professeur E. L. Bouvier,
Ministère de l'Instruction Publique, Paris, France.
Dr. Karl Jordan,
Zoological Museum, Tring, Herts, England.
Dr. Walther Horn,
Deutsches Entomologisches Institut, Berlin-Dahlem, Germany.

Dr. J. Henry Comstock,
Cornell University, Ithaca, N. Y.
Dr. W. J. Holland,
Carnegie Museum, Pittsburgh, Penna.
Dr. Samuel Henshaw,
Museum of Comparative Zoology, Cambridge, Mass.

On motion of Mr. Schaeffer, duly seconded and approved, the above-mentioned were unanimously elected to Honorary Membership in the Society.

Mr. Bigelow exhibited three specimens, *Hyperopherus punctatissimus* Rand, a Carabid beetle, collected by Mr. W. T. Davis, on White Face Mountain, Mass., and stated that he had taken this species in the Thunder Bay district, Ontario, Canada, where he found it under and in logs. The logs had to be of the right consistency to find these beetles in them, if either too soft or too hard none of these beetles would be found in them. He remarked on the peculiar odor of this species, saying that while many species had a disagreeable odor, the odor of this species was rather fragrant and musky.

Mr. Lemmer exhibited a box of moths containing two very beautiful Indo-Australian specimens, and a number of melanic forms and aberrations of North American species, among which were the following:

Apantesis figurata form *excelsa* Neum. (female); *Apantesis figurata* form *excelsa* ab. *lugubris* Hlst. (male); *Apantesis anna* form *persephone* Grt.; *Melanolophia canadaria* Gn., dark form, unnamed; *Ectropis crepuscularia* ab. *fumataria* Minot; *Epimecis virginaria* form *carbonaria* Haimbach; *Amphidasis cognataria* form *swettaria* Barnes and McDunnough; *Nacophora quernaria* form *atrescens* Hulst. The members then discussed Mr. Lemmer's exhibit.

Mr. Bell related some of his experiences during his visit to the Canal Zone and Panama in October, 1928.

Society adjourned at 10.25 p. m.

MEETING OF APRIL 11, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on April 11, 1929, at 8.20 p. m., with President Davis in the Chair and nine members present, *viz.:* Messrs. Bell, Bigelow, Eisenhardt, Engelhardt, Hunter, Lemmer, Dr. Marker, Mr. Siepmann and Mr. Sever; also six visitors, including Dr. William Schaus and Br. Barnes from the National Museum, Washington, D. C., and Mr. C. L. Pollard.

Minutes of the previous meeting read and approved.

Mr. Engelhardt presented the report of the Treasurer.

Mr. Engelhardt proposed for membership: Mr. William Eisenhardt, 156 East 8th Street, Flatbush, Brooklyn, N. Y. Mr. Eisenhardt being present, it was regularly moved and seconded that the By-Laws be suspended and that the Society proceed with the election of Mr. Eisenhardt, who was thereupon duly elected a member of the Society.

Mr. Engelhardt called attention to the death of Mr. O. C. Poling, in the latter part of March, and said that Mr. Poling was probably the most successful professional collector in this country; he collected principally in Arizona and southwestern Texas and was well known to a number of the members of the Society.

Mr. Pollard showed two specimens, male and female, of the moth *Argeme mittrei,* the giant-tailed moth of Madagascar, and a male and female of the Saturnid moth *Actias dubernandi* from China. He read an account of these two moths, by Mr. Eisenhardt, which will later be published.

Mr. Bigelow exhibited specimens of beetles collected by him in Iowa, and remarked on their habits and his experiences in collecting them.

Mr. Davis exhibited specimens of the cicada, *Okanagana rimosa* Say, found in the wash-up at Rockaway Beach, Long Island, by Mr. Engelhardt and Mr. Shoemaker, and on Long Beach, by Mr. Alfred J. Kistler, and remarked on the species; his paper will later be published. He also stated that Mr. Jeane D. Gunder had identified the butterfly from Virginia figured in the February number of the Bulletin of this Society as aberration *weidenhameri* Polaeck, figured and described in the Maryland Academy of Science Bulletin, 1925, page 10. A copy of Miss Polaeck's paper was shown. From the fact that the specimen there described, the one from Virginia (which is a female and not a male) and also a third one from Florida mentioned as in the collection of the Carnegie Museum, all closely agree it would appear that the form should be considered a variety rather than an aberration. He also called attention to Dr. Needham's book on the "Dragon-flies of North America."

Mr. Engelhardt related his experiences and observations on a recent trip to Florida, where he spent the month of March, primarily for the purpose of investigating the food plants and life histories of Aegeriidae or Clearwing moths. In his travels he depended largely on bus routes, now organized to reach rapidly and conveniently almost any region within the State. At Monticello, Gainesville, Sanford, Orlando, Lake Alfred and Okeechobee City he was assisted in his field work by men connected with the agricultural experiment stations and during a week's visit at the Royal State Park in the extreme southern part of the State, he enjoyed the company of Dr. W. S. Blatchley, of Dunedin, Fla., and Mr. and Mrs. Frank M. Jones, of Wilmington, Del. Weather conditions during the month were ideal—warm, sunny days and cool nights. Specimens or records of 20 species of Aegeriidae were obtained in addition to interesting collections in other families of insects. These will be shown and discussed at another meeting.

Adjourned at 10.30 p. m.

E. L. Bell,
Secretary.

Insects Atop of Skyscrapers.—On September 20th, 1929, whilst making newsreel photographs from atop of the larger of New York's skyscrapers, I was continuously annoyed by myriads of insects alighting on my head, face, hands, and clothing. These insects, for the most part hymenopterous, were attracted by the powerful beacons that illuminate the apexes of these immense buildings. My limited time and the nature of my work did not permit me to make a representative collection of the species then present but the species and specimens that evidently could be obtained in an hour or so of collecting would well be worthwhile.

The structures visited were the Woolworth Bldg. (60 stories—792 feet), the Chanin Tower (56 stories—680 feet), the Lincoln Bldg. (53 stories—638 feet), and the Paramount Building (35 stories—429 feet).

Employees of the buildings visited inform me that numbers of bats, migrating birds and miscellaneous insects are continuously found killed there, for blinded by the lights, they make their fatal impacts with great force on the sides of the skyscrapers.—Pinney Schiffer, New York City.

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A CONTRIBUTION TO THE KNOWLEDGE OF THE BIONOMICS OF BREMUS IMPATIENS (CRESSON). (HYMENOPTERA.)

By Theodore H. Frison, Illinois State Natural History Survey, Urbana, Illinois.

A. Introduction.

The present paper is the second of a series of papers dealing with the biology of the North American species of bumblebees. In the first paper (1928), the salient features of the bionomics of *Bremus bimaculatus* (Cresson) were recorded, detailed tables presented to show the development of the various castes from eggs to adults, and statements given regarding technique used in securing data for tables and other information. For the sake of brevity no tables are included in this paper and no introductory matter is repeated. The information herein presented is based upon experiments and observations made chiefly in 1919 and 1920, coupled with subsequent observations and a survey of the literature of our subject up to the present time.

During the course of my investigations of the biology of bumblebees, I have never had the opportunity to study in detail a nest of this species established under natural conditions. In 1919, there was a fair prospect that such an opportunity would come when a queen of this species occupied one of my domiciles buried near White Heath, Illinois. On May 17, this domicile contained the mother queen and a cluster of cocoons, but two weeks later when the nest was removed a field mouse was in possession of the domicile and the comb had been completely destroyed. In the laboratory, however, five nests of this species have been under close observation. Since the main features of the biological histories of bumblebees have been found to be the same regardless of whether the nests are started in artificial nests in the laboratory or out-of-doors under natural conditions, the data obtained by their study give a normal biological appraisement of this species. One of these nests, or colonies (Experiment 6, 1919), was studied in considerable detail, and data concerning the development from eggs to adults of workers and males obtained almost daily by methods reported in a recent article (1928). Before passing to a study of condensed tabulations necessary for an understanding of conclusions regarding the developmental stadia, a brief description should be presented of the start and growth of the colonies under observation; particularly the colony studied in much detail (Experiment 6, 1919).

B. Specific Life History Studies.

1. *Experiment 6, 1919.*

On April 18, 1919, a queen of *B. impatiens* was captured in the Brownfield Woods near Urbana, Illinois, and brought back alive to the laboratory in a small paper collapsible box. She was immediately placed in a small glass aquarium jar, screened on top, containing a supply of food. This preliminary procedure was intended to make the queen become " broody," a method previously explained in the Biological Bulletin (Frison, 1927a). Four days later she was removed to a rearing box containing an artificial nest, a wax honey pot, and a lump of pollen. These artificial nests are used to induce queens to start colonies under controlled conditions, and have already been described in detail in the Biological Bulletin (Frison, 1927a). The next day after being placed in the artificial nest the queen began to manifest an intense interest in the nest. On this date, April 23, she began the construction on the pollen lump of egg cells similar to those described for *B. bimaculatus* (Frison, 1928), and slightly altered the artificial honey pot. On the following day these cells were capped over and upon examination were found to contain creamy-white eggs. According to my notes, these first eggs were all laid in separate wax-pollen cells, about three millimeters long, two to three millimeters wide and two millimeters deep. The pollen for their construction came from the lump on which the cells were formed. The wax, however, had a different origin, for it was produced by the queen and scraped from her body onto the pollen lump. On April 26, the cells still contained eggs, but when next opened, on

May 1, they contained larvae. These egg cells were not opened during the interim between April 26 and May 1 through fear of causing the queen to desert her eggs. The eggs probably hatched the 29th or 30th of April.

In spite of being disturbed intermittently for about two hours on May 2, when motion pictures were taken under high power lights of the comb and queen, her majesty continued to show an interest in her brood. The stage of development of the comb at this time is well shown in figure 1. By the 10th of May, the larvae had progressed so far as to spin cocoons and the queen had laid more eggs in new egg cells built on top of the cocoons. Each of these egg cells contained from two to four eggs, laid almost horizontally side by side and contiguous to one another in the cell. Evidently her early habit of laying one egg in a cell, so reminiscent of the solitary bees, had ceased. At this period in the development of the colony, a broad shallow groove was in evidence on the top of the comb. This groove owed its origin to a peculiar habit of the queen which always assumed the same position on her incipient comb when incubating her first brood. The taking of motion pictures of this queen on the nest and of still pictures with the queen removed on May 9 and 10, luckily, once again did not cause the queen to forsake her brood. Figure 2 shows the comb as it appeared on May 10, before the wax and pollen was removed from the first cocoons. This figure shows, also, the eggs in the egg cells, and the groove or " saddle " occupied by the queen when brooding on her first larval cells. On May 12, the honey pot was again altered by the queen so that it was capped on top with somewhat of a recurved hood. The next day a new egg cell, much larger than those made first, was constructed, and on May 14, this cell was capped and contained two eggs. The following day the first worker emerged. The fact that this first worker was of normal size served not only as an indication that the queen was being properly fed but that the queen was also properly feeding her young. A total of five workers emerged by May 18. On this date, more eggs were laid and the presence of some fairly well-developed larvae was noted. These larvae undoubtedly came from eggs laid on May 10. Not content with the single artificial honey pot, on the 19th of May the workers made an additional one of wax and pollen adjacent to the artificial one. The 29th of May, disclosed two additional workers; the colony at this time consisting of the mother queen, seven workers, larvae and eggs.

The colony had now become so large and well established that a detailed study of the duration of the various developmental stages was begun of this last-mentioned date.

The addition of numerous wax-pollen honey pots accompanied the general and gradual increase in size of the comb. On May 25, there were six of these honey pots, three on each side of the artificial one, and all separate from the comb. A pillar of wax and pollen had also been constructed to connect the comb with the wax-lined roof of the artificial nest, and as a support served to steady the comb. At this date it was no longer necessary to remove the queen when examining the comb, because she showed no inclination to fly from the nest. Occasionally, a whiff of my breath brought forth a protest in the form of a vigorous buzzing, but she soon began brooding again over the comb with her head nestled down between the cocoons as if to avoid the light. The increase in the development of the comb since May 10 is well shown in figure 3, a photograph taken on June 10. By June 11, the colony contained twenty-two workers and was sufficiently advanced to allow the bees their freedom for the gathering of nectar and pollen. I may add that the workers were becoming very vicious and it required considerable time and patience to remove them one by one each day before examining the comb; a necessary procedure to avoid being stung.

After being allowed their liberty the workers speedily took advantage of their privilege and were soon bringing in supplies of honey and pollen. More wax-pollen pillars for supporting the comb were constructed and also honey pots of the same material on the outer edge of the comb. As soon as the full-grown larvae spun their cocoons the workers removed the wax and pollen covering them and used it to good advantage elsewhere. At this stage in the development of the colony, honey was being used in large quantities and scarcely any was to be found in the honey pots in the morning. Pollen was apparently less in demand and some of it was stored in empty cocoons. The exceedingly tall honey pots on the outer edge of the comb was a peculiarity of this nest during the middle of June. By June 16, the average number of eggs in a cell had increased to five, and the most favored place for constructing the new egg cells was on the tops of newly spun cocoons. The comb continued to grow so rapidly that on June 26 it was necessary to remove the colony to one of my large observation boxes.

The growth of the comb and the increase in number of workers did not suffer as a result of allowing the bees their freedom and the discontinuance on my part of supplying them with food, and by the 3rd of July I found myself obliged to remove more than fifty workers every time I wished to examine the comb. Several fairly hot days about this time so increased the temperature in the nest that some of the bees resorted to fanning the comb with their wings; thus creating an air movement for the ventilation of the nest. This ventilating of the nest is responsible for the myth of the "trumpeter" bee, which according to the celebrated Hoffer (1883) aroused its companions to their work. If I disturbed the nest by blowing into the entrance or jarring the box containing the nest, the large workers were the first to fly out in defense of their home. A gradual increase in the size of the workers was evident as the season advanced, and by July 9, many very large workers appeared. It is also worth recording that at this time, for the first time, a real surplus of honey existed in the nest. This was stored in specially made honey pots and in empty cocoons in the center of the comb. A surplus of pollen also existed and continued to accumulate and to be stored as before in empty cocoons. The old mother queen now was more prolific than ever and scarcely a day passed when she did not lay eggs. In fact, between July 4 and the morning of July 7, ten new egg cells were fashioned and an average of six eggs laid in each cell. This is at the rate of about twenty eggs a day. The fact that these eggs all produced workers is proof that none of them were laid by workers.

During the latter part of July, the accumulation of a surplus of honey and pollen continued unabated. The only change in the appearance of the comb, except the increase in its size, was the development of a wax-pollen sheet or thin wall on the side of the comb nearest the entrance. This was apparently built to exclude light. By the first of August, the old mother queen began to show, by the loss of hair on the dorsum of her abdomen, the effects of her brood rearing and comparative old age. At nine o'clock on the morning of August 2, one hundred and nine workers were in the nest and additional ones were foraging in the field. The presence of so many workers in the nest greatly increased the amount of preliminary work necessary before the comb could be closely examined, and the increase in number of egg, larval and pupal cells naturally lengthened the time required for the taking of data regarding the developmental stadia. On August 11, the nest contained 116 workers in addition to an unknown number foraging in the field. At this time the colony reached its "climax" of worker production and from then on the number of workers gradually diminished. The gradual loss of hair on the dorsum of the queen, first noticed about the first of August, had proceeded so far by this time that a large portion of the dorsum of the thorax and nearly the entire dorsum of her abdomen was nude. Besides the workers and mother queen, the nest contained on this date 29 good cocoons, fifty-six larvae in various stages of development, and fourteen egg cells containing an average of three to four eggs.

The first males, twelve in number, were found in the nest on August 17. Five days later I found but eighty-eight workers in the nest, a smaller proportion than existed on August 11. There still remained a surplus of honey and pollen at this time and some pollen was being stored in the wax-pollen cells on the edge of the comb as well as in empty cocoons. On this same date, several wax-pollen cells—larger than any egg cells thus far made but smaller than any of the honey or pollen storage cells—were built on the tops of cocoons. A small quantity of loose pollen was placed in the bottom of each of these. Because of their size I was not at first certain whether these cells were for the reception of eggs or pollen. Their position clearly indicated that they were egg cells, but the pollen was something I had never seen thus placed in them by this species. Furthermore, their diameter of about seven millimeters was unusual for the egg cells of this species. The male population had by now greatly increased and on September 5 sixty-four of them were found in the nest, besides a few additional ones which retreated so deeply into the labyrinth of comb that they could not be extricated without injuring the comb. On this same day eggs were discovered in the large wax-pollen cells first noticed on August 22. The decrease in workers was now very manifest, and at this time but nineteen were found in the nest. Figure 4 is an illustration of the comb as it looked on September 6; a period of about four months and a half since the mother queen first started the nest. Comparing figure 4 with figure 3, the latter taken on June 10, the increase in the size of the comb is evident. Another view of the comb as shown in figure 4 is given in figure 5, except that the comb is shown in the artificial nest and the large observation box into which it was transferred on June 26. On September 7, the old queen died and a short time afterwards she was dragged into a corner of the nest by her worker offspring. It was not until after the queen died that there were signs in this nest of workers developing egg-laying habits. On September 16, one of the few remaining workers seemed to show an interest in the comb and certain cells containing eggs. These eggs were certainly laid by workers, for the cells were built after the death of the old mother queen.

In keeping with the gradual decline in numbers of bees in the nest was the increase in numbers of the bumblebee wax-moth (*Vitula edmandsii* Packard), and due to the work of their larvae the once large and neat-appearing comb had rapidly deteriorated by the end of September.

2. *Experiment 11, 1919.*

The queen used in Experiment 11, 1919, was captured on April 16 in the Brownfield Woods, near Urbana. For several days following her capture, she was confined with several other queens in a glass aquarium jar containing a liberal food supply to make her become "broody." Then on April 22, she was placed with another queen of the same species in an artificial nest. During her brief stay in the glass jar this queen killed two other queens of her own species and soon after being placed in the artificial nest with another queen she continued her murderous career by killing the other queen. Because she did not exhibit signs of interest in this artificial nest, she was confined once again in the bell jar. On May 16 she was placed for the second time in an artificial nest, but this time without another queen to arouse her propensity for killing. On May 18, the queen exhibited a great interest in the nest and constructed an egg cell on the pollen lump. This was similar in all details to the one first made by the queen in Experiment 6, 1919. Thereafter her interest in the nest continued, and on May 19 there were three egg cells on the pollen lumps. Fear of disturbing her was responsible for neglecting a count of the number of eggs laid in these first cells. Judging from the size of the cells, the number of the eggs must have been very small. Larvae were first noticed on May 24 and from then on they grew rapidly. Eight days after the larvae were first observed two of them spun cocoons and a third did so the following day. The fact that from the first egg cells there were eventually produced but three workers is further evidence that the first three cells contained only a few eggs, and perhaps but one each. As soon as the first two cocoons were spun on June 1, the queen constructed a new egg cell on one of them. On June 2, this egg cell was closed and contained four eggs. The same day the third larva spun its silken pupal case. Five days later, additional egg cells were present on the cocoons.

The first worker emerged on June 10, one more on June 11, and a third on June 13; all seemed normal in every respect. By the middle of June the nest contained the mother queen, three workers, larvae and eggs. At this time, when the colony was progressing so nicely, the queen accidentally lost a leg and this seemed to have a bad effect on the further development of the entire colony. Nevertheless, the queen with the help of two workers (one of them escaped on June 19 and never found its way back to the nest) continued her work as well as possible. More eggs were laid on June 26, but the colony was doomed, as the queen was scarcely able to perform her duties. Egg-laying continued, however, and the queen even laid some eggs on July 3 in a cell built of honey bee wax, separate from the comb, on the wax-lined floor of the nest. The first week of July, after transference of the comb and bees to another nest, the colony seemed to acquire a new lease on life. In one egg cell, first discovered on July 6, I found six eggs. These were all creamy white in color and were laid contiguous to one another in a horizontal position in the cell. By the middle of July, a few more larvae spun cocoons and on July 28, four more workers emerged. The appearance of these new workers presented an opportunity of allowing the bees the liberty of foraging for themselves, and so on July 30 the colony was released. The workers immediately assumed the duty of providing food for the colony, but the death on August 4 of the crippled old queen brought to a close its further development.

3. *Experiment 13, 1919.*

Only that part of this experiment relating to *B. impatiens* will be presented here, since this experiment will be more fully reviewed in another paper under the topic of queen substitution and mixed colonies. This experiment was begun originally with a queen of this species taken at Dongola, Illinois, on May 5. Prior to the time of her introduction into an artificial nest on May 25, the queen was kept in the customary manner to make her become "broody." On May 27, the queen showed a great interest in the nest, and two egg cells were constructed on the pollen lump. The succeeding day, the cells contained eggs and were completely capped over in the usual manner. Larvae were first noticed in these cells on June 2, but it is probable that the eggs hatched before this date. An additional egg cell was prepared on this latter date and the colony seemed destined to a normal development. For several days afterwards, due to my unavoidable absence, this nest was not examined and when the nest box was next opened on June 7, I found the queen entangled in the cloth top of the artificial nest and almost dead. On being fed she revived, but displayed no further interest in the nest. In hope of arousing her interest in the comb by means of the presence of another queen, a queen of *B. bimaculatus* (Cresson) was placed in the nest on June 8. At first this ruse seemed to be successful, but on June 9 all trace of interest in the nest had again disappeared. Realizing the folly of further efforts to get the mother queen to nourish her young, I decided to use this comb for experiments in queen substitution. Accordingly, a queen of *B. auricomus* (Robertson) was added to the assemblage. Eventually the *bimaculatus* and *auricomus* queens became interested in the nest, but further information concerning this colony is out of place here. It should be added, however, that very small workers of *B. impatiens* emerged on June 26 and 28, under the care of the *B. auricomus* queen and continued on the best of terms with their foster mother. Both workers were very small and the one that emerged on June 28 was crippled, clearly showing the effects of malnutrition and the lack of attention during their infancy—the period from June 2 to June 10. One of these workers even lived to maintain friendly relations with workers produced by the *auricomus* queen.

4. *Experiment 13, 1920*

This experiment was begun on May 30 with a queen of *B. impatiens* received on May 10 from Dr. Hugh Glasgow of Geneva, New York. Previous to May 30, the queen had been prepared in the usual manner for colony production. Interest was immediately taken in the nest and on June 2 an egg cell containing several eggs was found in the nest. This cell was first observed to contain larvae on June 7. The colony progressed nicely until June 22, when I had to abandon it for various reasons. This experiment was of interest only in that it demonstrated that queens of bumblebees of this species can be transported from one section of the country to another and be made to produce colonies under artificial conditions.

5. *Experiment 16, 1920*

In this experiment I used a queen of *B. impatiens* received on May 21 from Mr. C. A. Frost, of Framingham, Massachusetts. After the usual procedure preparatory to nesting experiments, the queen was placed in an artificial nest on June 6. On June 7, the queen manifested an interest in the nest and on June 8 the nest contained an egg cell with three eggs. The next day another egg cell was made and eggs deposited in it, and also an additional egg cell and eggs on June 10. Larvae were first observed on June 13 and these continued to develop until the study of the nest was abandoned on June 22. This experiment confirmed the fact (See Experiment 13, 1920) that queens can be shipped to various localities without interfering with their nest building instincts.

C. BIOLOGICAL SUMMARY

1. *Resumé of Literature*

In keeping with the general status of our knowledge concerning the bumblebees as a whole, very little has been published regarding the habits of this common and widely distributed species. Cresson (1863) was the first entomologist to record the finding of a nest of *B. impatiens.* He states that the nest contained thirty queens, thirty-eight workers and thirty-four males. Besides noting the small size of the workers as compared with that of the queens and the lack of variation in the coloration of the different castes, he gives no information concerning the comb or habits of the bees. A year later (1864), Mr. F. W. Putnam recorded finding a nest of *B. virginicus* [=*B. impatiens*] "under an old stump in an orchard," but gives us no further details. He mentions, also, the capture of three males of this species which were "flying under a large tree on which they frequently alighted." He says further, "So much did these bees resemble large flies in their actions, that at first I mistook them for those insects." I am quite sure this latter note relating to the habits of the males refers to *B. separatus.* In 1863, Cresson described *B. impatiens* from all three castes, but the male he then described as this species possessed very large eyes and differed in other ways from the female. Three months after publishing the description of *B. impatiens,* Cresson (1863b) had the opportunity to study a nest of this species found near Kaign's Point, New Jersey, on October 7, 1863. This led to the discovery of the true male of *B. impatiens* and the assignment of the male "Described under *B. virginicus*" to a new species which he named *B. separatus.* The fact that the males of *B. separatus* were described in 1863 under the name *B. virginicus,* explains Putnam's determination of the males he caught flying about trees in 1864 as this species. Accordingly, the habits Putnam recorded for the males of *B. impatiens* relate to *B. separatus* and prove to be in keeping with the habits of the males of *B. separatus* as I have observed them.

The next published statements regarding the biology of *B. impatiens* are those of Riley (1880) who identified a bumblebee caught robbing the "honey bees of their scanty stores" as this species. Eleven years later Howard (1891) reports finding large numbers of these bees attracted to the blossoms of the horse-chestnut and described their peculiar actions as probably being due to the toxic effect of the nectar.

Franklin (1913) reports having taken several nests of this species. He says that "as far as I have been able to ascertain, they are invariably subterranean and the colonies often consist of a very large number of individuals. The largest *Bombus* colony which I have ever taken belonged to this species, and was taken at Amherst, Massachusetts, August 31, 1904." In this colony he found four queens, fifteen males and three hundred and thirty-six workers. One hundred and fifty-four, of the three hundred and thirty unbroken cells in the nest, "were queen cells and the majority of the young inside them were still in the larval state." According to Franklin the queen cells averaged about eighteen millimeters in length, and, though the remaining cells varied considerably in size, they were "on the average a little more than one-half as long as the queen cells." The nest itself was made of old grass, in an old mouse burrow two and one-half feet below the surface of the ground.

Jackson (1920), says that " In October the males are practically the only representatives of the Bremidae to be found" and that the workers fly very late in the fall.

As far as I am aware, the only other contributor to a knowledge of the biology and habits of this species is Plath (1922).

This author records taking sixteen "nests of this species during the summers of 1921 and 1922." All of these 16 nests were subterranean as well as several others which were not dug up. "They were from 1 to 3 ft. below the surface, and had tunnels varying from 18 inches to 5 ft. in length. A number of these nests were situated in decayed stumps." Plath states, also, that these colonies were very populous and records one colony as having thirty-one males and fifty workers, a second with about one hundred and twenty-five workers, and another with more than four hundred and fifty workers. The workers are stated to appear about the first week in June "and the majority of the young queens and males hatch in August and September." It is interesting to note that Plath was impressed by the bellicose disposition of this bumblebee for he remarks in a footnote that this is "an exceedingly pugnacious species." My experiences with this species agree with the statement of Plath. In spite of many precautions I was stung by the workers on several occasions. The same trait in behavior finds its expression in the manner in which the workers attack *Psithyrus* queens introduced into their nests. In one experiment of this nature made by Plath, seventeen workers surrounded and attacked the intruding queen; so many in fact, that at least one of them met death through the ill-directed sting of its fellow worker.

2. *Anthophilous Habits*

The reader is referred to the valuable paper of Lutz and Cockerell (1920) for a summary of most of the records relating to the flowers visited by this polytropic species of bee. A few of Robertson's records have been overlooked in this list and these, together with those which have accumulated since then, are as follows:

Robertson (1890–1899): *Cephalanthus occidentalis, Libelia syphilitica, Campanula americana, Petalostemon violaceus, Delphinium tricorne, Dicentra cucullaria, Claytonia virginica, Viola padata* var. *bicolor, Dentaria laciniata, Impatiens fulva, Impatiens pallida, Tradescantia virginica, Erythronium albidum, Verbena stricta, Dianthera americana, Lythrum alatum, Hypericum cistifolium, Clematis virginiana, Clematis pitcheri,* and *Staphylea trifolia.* Jackson (1922): *Pontederia* *cordata, Chrysopsis mariana,* and *Xolisma ligustrina.* Rau (1920) : *Aster multiflora.*

In addition to the already exceedingly numerous lists of plants frequented for nectar or pollen I have found this species on *Monarda fistulosa, Melilotus alba, Trifolium pratense* and *Ligustrum vulgare.*

3. Duration of the Developmental Stadia

In order to secure data regarding the duration of the developmental stadia of *B. impatiens,* one colony (Experiment 6, 1919) of this species was closely studied from its inception to its end. During the interim from May 22 to September 16, fifty-four examinations were made of the contents of all cells and cocoons comprising the comb. Although these examinations did not give a complete record of the development of all the stages of each bee produced by the mother queen, they were sufficient to present a good approximation of the duration of the various developmental stadia for the workers (females) and males. Since no queens were produced in this colony, on information regarding their developmental stadia can be given. Because the tables giving this data are extensive, only by deductions from them are presented. For a complete understanding of the nature of the complete tables, and how the essential data were secured, the reader is referred to a recent paper (Frison, 1928).

It was found that the egg stage is the shortest and the larval stage the longest of the three development stadia of the workers and males. The workers required between four and five days in the egg stage, twelve to fourteen days in the larval stage, and six to eight days in the pupal stage. The males averaged between four and five days in the egg stage, fifteen days in the larval stage, and eight days in the pupal stage.

The total time required for the production of the adults varied. It was from twenty-two to twenty-seven days for the workers and twenty-seven to twenty-eight days for the males. During June some evidence was obtained which indicated a lengthening of the life cycle.

4. Seasonal Appearance of the Castes

There is a difference in the time of appearance of the three castes of bumblebees. This is because only the queens are able to hibernate and their first progeny are ordinarily workers. When writing about the seasonal appearance of the castes I have adopted the practice of considering first the time of the appearance of the old queens in spring, second the workers and lastly the males. This is their ordinary sequence in a calendar year. However, since the queens found in spring were produced in the preceding summer or fall another arrangement might be used. The chief objections to beginning an account of the seasonal succession of the castes at the time the new queens emerge from cocoons are the difficulty of securing data concerning this period unless colonies are reared, and the fact that hibernation must take place before any progeny can be reared.

The queens of *B. impatiens* are usually the second species of bumblebee to appear in spring in the vicinity of Urbana, Illinois. The honor of being first is possessed by the queens of *B. bimaculatus* (Frison, 1928). The earliest records I have for the queens of *B. impatiens* in Champaign and Vermillion Counties during a period of seven years are as follows: May 2, 1914, University Woods, Urbana; April 23, 1915, University Woods, Urbana; May 5, 1916, University Woods, Urbana; May 14, 1917, University Woods, Urbana; April 18, 1918, Brownfield Woods, Urbana; April 13, 1919, Mahomet, Illinois; and May 8, 1920, Oakwood, Illinois. This list gives a very good idea of the time the queens are first encountered in spring in this locality. The time of appearance is each year directly correlated with the advance or retardation of spring. The lateness of their flight varies in direct proportion to the time of their first appearance, establishment of a nest, and weather conditions. In this vicinity the old queens of *impatiens* are rarely encountered in the field after the end of June.

The workers are seldom seen out of doors before six weeks after the appearance of the queens. In 1919, cocoons of workers were found in a nest at White Heath, Illinois, on May 17. This place was but a few miles from the place where I first captured the first queen of *B. impatiens* of the season on April 13. Workers were caught in the Brownfield Woods in 1915, on June 6. This latter capture was just about seven weeks after the first queen of the season was collected two miles away. Workers continue to be encountered in the field as late as October; their lateness depending on the character of the fall weather. The earliest record I have for the appearance of the males in this vicinity is July 26, 1913, in the University Woods. Ordinarily the males appear much later, and I have taken them at Champaign, Illinois, in 1911, as late as October 9.

The new queens usually appear at about the same time as the males but are seldom captured by collectors. This is because they speedily seek hibernating quarters and spend little time on flowers. Franklin records finding four queens—three or all of which must have been young queens—in a nest he opened on August 31, 1904, at Amherst, Massachusetts. Franklin states also that the nest contained "one hundred and fifty-four" queen cells and "the majority of the young inside them were still in the larval state." Cresson found thirty queens in the nest found at Kaign's Point, New Jersey, on October 7, 1863. These dates show that the queens are ordinarily produced in the late summer and early fall.

In most other parts of the range of this species in North America the same general sequence in the appearance of the castes takes place. I have records of the queens taken in North Carolina the 31st of March and in Georgia on March 21. These records show the influence of the warmer temperatures prevailing in the southern part of the range of this species. The same factors that cause an earlier appearance of the queens in the southern part of their range hasten the appearance time of the workers, new queen and males. Plath says that in Massachusetts the "majority of the young queens and males hatch in August and September." This statement is in agreement with my conclusions regarding the usual time of appearance of these castes. I have seen a male of *B. impatiens* from Miami, Florida, which was collected on February 6, 1903. Either this specimen has been erroneously labeled as to date or in Florida a modification of the general life history of this species occurs which is suggestive of bumblebee life in Corsica as it is pictured by Ferton (1901), in Sardinia by Krausse (1910) and in the state of São Paulo, Brazil, by von Ihring (1903).

5. Caste Ratio

The worker caste numerically dominates in this species. The largest number of workers I ever found at one time in Experiment 6, 1919, was on August 11 when there were one hundred and sixteen of them in the nest. According to my records, approximately two hundred and thirty workers were produced in this nest. The difference in number between the two figures just cited is easily accounted for by the fact that many of the workers were out of the nest gathering nectar and pollen when the nest was examined on August 11. Some died from time to time, and on several occasions it was necessary to kill others. Approximately eighty males were produced in this nest; making a ratio of about one male to three workers. The development of queens would undoubtedly have changed this ratio.

In the nest examined by Franklin (1913) on August 31, 1904, at Amherst, Masachusetts, the number of workers, males and queens was, respectively: three hundred and twenty-one, fifteen, and four. Franklin says there were also one hundred and fifty-four queen cells and one hundred and seventy-six other cells probably destined to produced mainly males. Counting the cells as well as the adults the number was about approximately three hundred and twenty-one workers, one hundred and ninety-one males, and one hundred and fifty-eight queens. As the males and queens were apparently just emerging, their number is nearly correct. In the case of the workers I have no doubt that as many as four hundred were produced. If we accept this latter estimate for the number of workers, about two workers were produced to every male and eight workers to every queen. In the nest found by Cresson (1863) on October 7, 1863, at Kaign's Point, New Jersey, there were thirty-eight workers, thirty-four males, and thirty queens. The small number of workers in this nest was no doubt due to the lateness of the season.

In one of the nests found by Plath (1922) there were about four hundred and fifty workers, but no mention is made of the number of queens or males. In another nest this same author found seventeen males, about seventy-five workers, and several inquiline bees (*Psithyrus*). A third nest yielded thirty-one males, about fifty workers and many other insects. In these nests, it is apparent that the workers dominated.

6. *Size of Colonies*

The colonies of this species attain considerable size, as evidenced by the preceding records of Franklin (1913) and Plath (1922) and those of my own. Experiment 6, 1919, produced with certainty two hundred and eighty-three bees, and adults emerging from groups of uncounted cells must have numbered fifty more; making a grand total of over three hundred and twenty-five bees. In the nest Franklin studied there were three hundred and forty bees, besides three hundred and thirty cells or cocoons containing various immature stages. The production of adults by the end of September in this latter colony would have been nearly seven hundred; truly a large colony of bees. Plath (1922) mentions one colony which consisted of four hundred and fifty workers on August 4, 1921. When small colonies of this species are found it is an indication of the influence of deleterious conditions, rather than a low rate of fecundity on the part of the queens of this species.

7. *Variation.*

B. impatiens is apparently not susceptible to marked color variations. In contrast to certain other bumblebees, too, the males and females are quite similarly colored. This is in keeping with their general color constancy or fidelity to design. The only color variation worth mentioning occurred in the case of three workers; one observed in a nest on July 7, and two others on August 22. These workers had the dorsum of the thorax covered with a bright orange-yellow pubescence instead of the usual pale, whitish-yellow color.

In respect to variation in size, however, this species is most interesting. As is customary with most species of bumblebees, the greatest range in size is exhibited by the worker caste. The variation in length of the workers may range anywhere from eight to seventeen millimeters. The most significant feature of this aspect of variation in this species is the fact that one never has difficulty in separating queens from workers as is sometimes the case with certain species. This may not always hold true, but such has always been the case with the many specimens I have collected, reared and studied in collections throughout the country. Franklin (1913) gives the length of the queens as sixteen to twenty millimeters, but most of the queens I have studied measured between twenty and twenty-five millimeters. The significance of this isolation in size between the queens and workers was discussed by the author in another paper (1927b). Briefly, in that paper *B. impatiens* was considered as a species with a high fecundity in the queen caste and with a rudimentary specialization of the more highly developed caste system of the honeybee. As a general rule, the males are as large as, or slightly larger than, the workers, but much smaller than the queens. A variation, however, may occur in the size of the males even from the same nest; an indication that trophogeny plays an important role in the size of the adults. For instance, two of the males found in Experiment 6, 1919, on September 5, were only nine millimeters in length; whereas certain other males were fifteen millimeters.

In order to get data relative to the extent of variation in the male genitalia (structural characters of much importance in systematic investigations) of individuals from the same nest, ten males showing considerable variation in size were selected from forty-seven removed from Experiment 6, 1919, on September 5. The genitalia of these males varied in size in proportion to the size of the bee, but no noticeable variation in their form was discernible. Other characters such as those offered by the malar space and antennal segments indicated the same structural constancy. Freak individuals may appear, but their crippled condition is due to malnutrition, injury to pupae, etc.

8. Cocoons and Food Storage

Silken cocoons are spun by the larvae about two days before pupation. Although some silk is spun by larvae previous to the spinning of the cocoons, it is only for the purpose of holding together the elastic wax-pollen walls of their cells. Since many eggs are laid in a single cell it is evident that at least for a short time after the larvae hatch that they occupy the same wax-pollen cell. After a short time the larvae begin to separate from one another and strands of silk become evident in the wax-pollen cells which surround them. As the larvae increase in size the silken threads become more numerous, and when larval growth is completed the cocoon is rapidly spun. These cocoons, dirty yellow in color, are the most conspicuous part of a bumblebee nest. They vary in size just as the adults do, some being large and others small. Three worker cocoons measured on July 23 were twelve to fifteen millimeters in height and eight to nine millimeters in breadth.[1] As is the case with the other species which I have studied, the wax-pollen necessarily coating the cocoon when first spun is soon removed by the bees and used elsewhere. When a worker is ready to emerge it partly cuts off with its mandibles the upper part of the cocoon. I have never seen workers on the comb assisting in this operation. After the bee has emerged the cocoons are completely renovated and both honey and pollen are stored in them. Cocoons so stocked with provisions are then often closed over on top by the wax-pollen used so generally in the comb construction.

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[1] Two male cocoons measured on September 16 were, respectively, ten to twelve millimeters in height and four and one-half to five and one-half millimeters in breadth.

With the gradual increase in size of the comb and the development of workers, the original honey pot made by the queen becomes insufficient to meet the needs of the colony and others are constructed. In Experiment 6, 1919, the first of these additional honey pots (Figure 6) was built alongside of the artificial one, but later in the season others were erected around the edge of the comb. During the early part of the season most of the surplus honey was stored in the honey pots, but later cocoons were also utilized for this purpose. Most of the surplus pollen was stored in empty cocoons near the center of the nest, but some was also stored in wax-pollen cells. The habit of storing the pollen in cells or cocoons apart from the clusters of larvae, caused Sladen to call the English species having this habit " Pollen-storers." Plath (1927) has coined the term " Amarsipoea " as a substitute for " Pollen-storers." As recently pointed out (Frison, 1928) the sectional name *Anodontobombus* Krüger (1917 and 1920) can probably be used for biological and morphological classifications.

9. Mating.

I have never witnessed the mating of males and females of this species, but a male and a queen of this species captured *in coitu* are in the insect collection of Purdue University at Lafayette, Indiana. These bees were taken at Lafayette on September 25, 1915. The late production of the queens and males of *impatiens* makes late matings unavoidable; a seasonal adjustment quite different from *bimaculatus* whose males and females are produced and mate in mid-summer (Frison, 1928).

10. Nesting situations.

There is very good evidence to indicate that the queens of this species prefer to nest beneath the surface of the ground. All of the nests taken by Franklin (1913) and Plath (1922) were subterranean. Plath says that the nests he studied were reached by " tunnels varying from 18 inches to 5 ft. in length." The nest found by Putnam (1864) was located under an old stump. The colonies I had under observation were started in artificial nests and others occupied artificial domiciles buried in the ground (Frison, 1926). No doubt other nesting sites than those under the ground are occasionally used by the queens in the cases of necessity.

11. Hibernation.

Thus far the writer has never been fortunate enough to find hibernating queens of this species of bumblebee. Plath (1927), however, has published some exceedingly important observations regarding this phase of their biology and reports that under normal conditions the young queens of this species hibernate in the soil near the entrance to the maternal nest. He further states that from thirteen to forty queens hibernated in a small space near the entrance of a former nest. These observations confirm a story told me by a young eastern entomologist, whose name I have forgotten, that he once found nearly a hundred queens of *B. impatiens* hibernating in a small area in sandy soil near New York City.

12. Domestication.

This species is well adapted for domestication, or semi-domestication. Experiments reported in this paper and elsewhere (Frison, 1927a) demonstrate that queens of *B. impatiens* can be induced to start colonies in artificial nests without the aid of workers and that the queens can be attracted to artificial domiciles (Frison, 1926). Additional evidence of the suitability of this species for domestication has been published by Plath (1923).

In contrast to *B. bimaculatus* which is also easily reared under controlled conditions (Frison, 1928), *B. impatiens* is a most promising species from the standpoint of the possible economic exploitation of bumblebees. The colonies of this species are started early in the season and continue until fall, the species has a wide natural distribution, the colonies are large, and the bees are well suited for the pollination of such valuable crops as red clover. The species likewise offers exceptional advantages to the laboratory worker.

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PLATES XXIV–XXVI.

Figure 1. Start of the comb of *Bremus impatiens* under controlled conditions, showing: *a,* the pollen lump containing the first egg cells and eggs; *b,* the artificial honey pot. May 2 (From Biol. Bull., 1927, p. 55).

Figure 2. Comb of *Bremus impatiens* of about two weeks' development, showing: *a,* several eggs in the same cell; *b,* one of the first larval cells; *c,* groove caused by the queen brooding on the first larval cells. May 10 (From Biol. Bull., 1927, p. 57).

Figure 3. Comb of *Bremus impatiens* of about six weeks' development, showing: *a,* wax-pollen pots for the storage of honey; *b,* empty cocoons used for the storage of honey and pollen; *c,* groups of various-sized larvae. June 10.

Figure 4. Comb of *Bremus impatiens* after the climax development has passed, showing: *a,* empty cocoons; *b,* larval cells; *c,* wax-pollen pots; *d,* wax-pollen shield. September 6.

Figure 5. Comb of *Bremus impatiens* in large observation box. September 6.

Figure 6. Wax-pollen honey pots of *Bremus impatiens.* One of these was the first honey pot constructed by the queen. Enlarged 5 ×.

Figure 7. Queen of *Bremus impatiens* " carding " materials over comb.

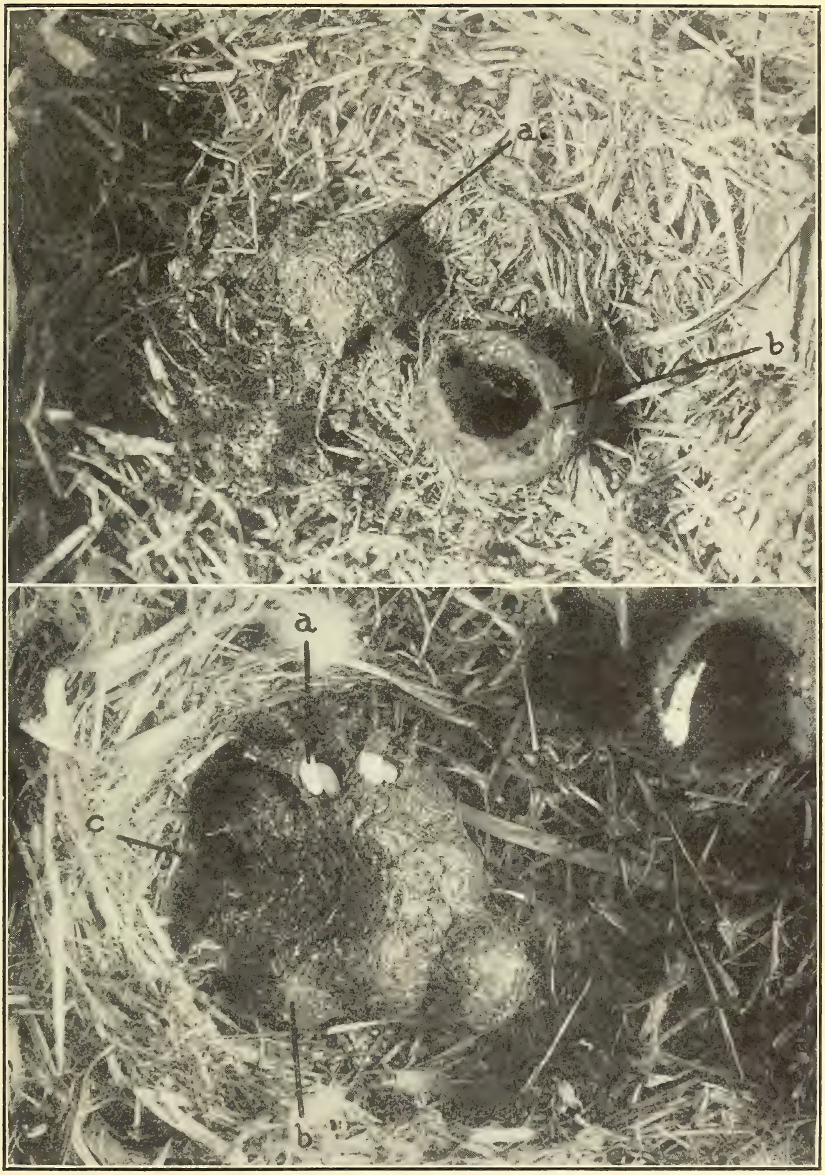


Fig. 1—Upper = Fig. 2—Lower

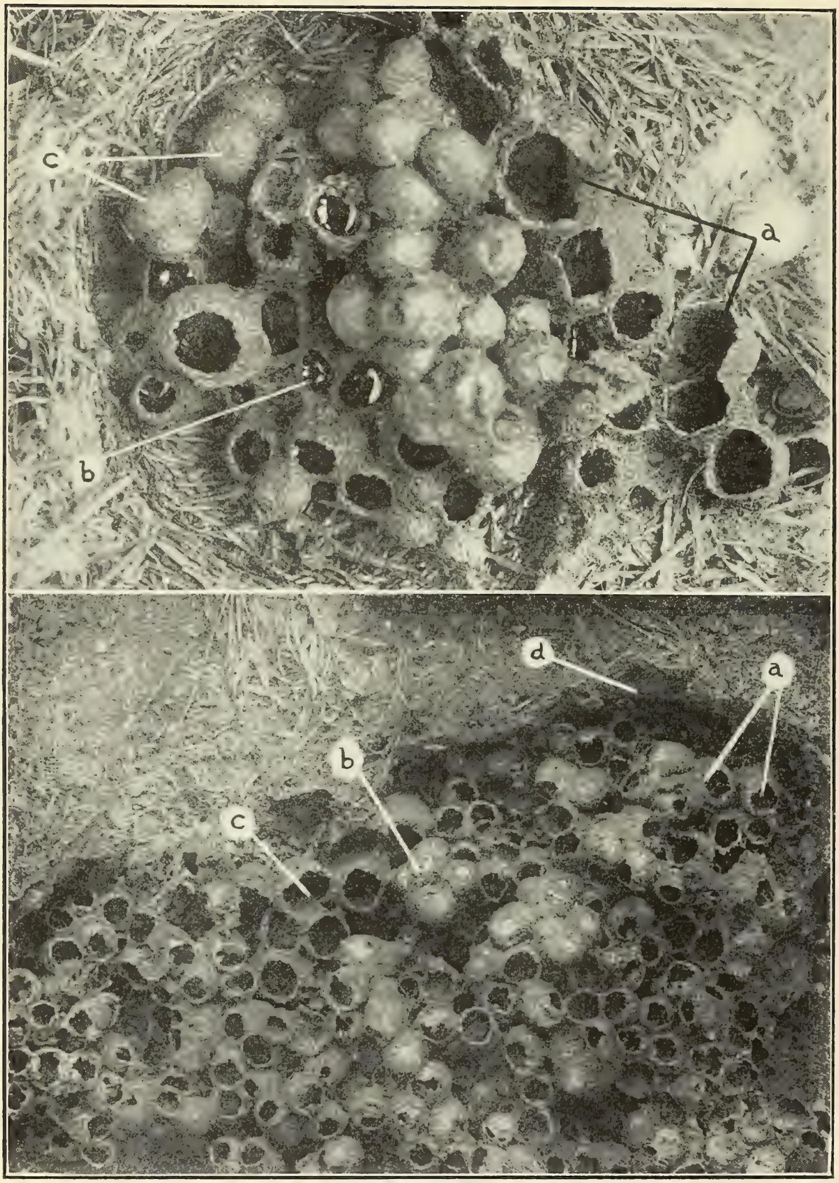
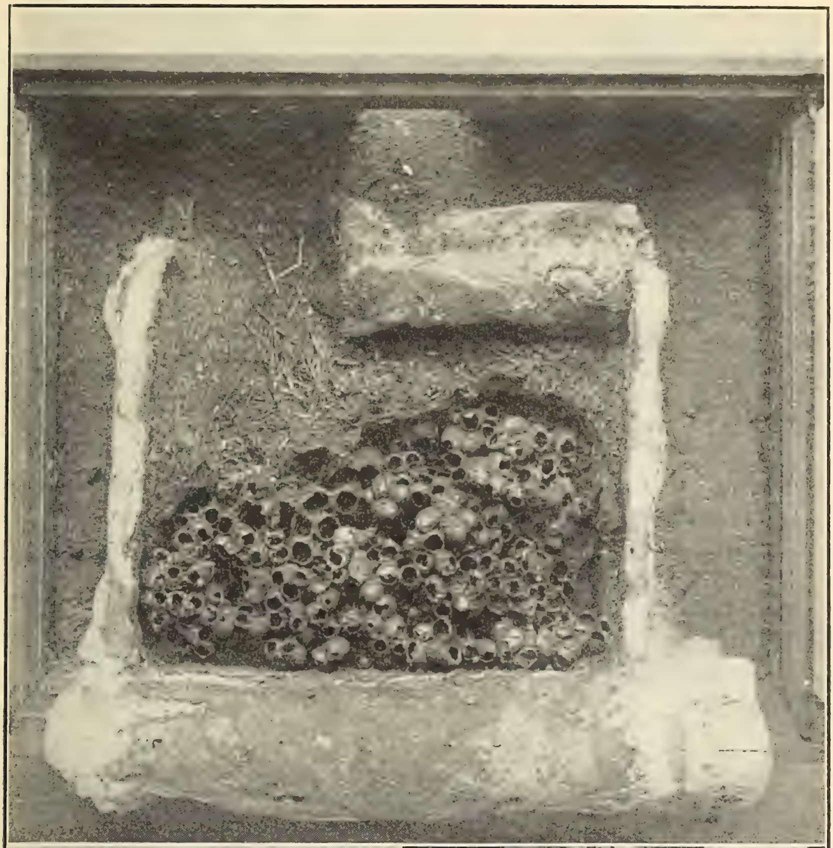
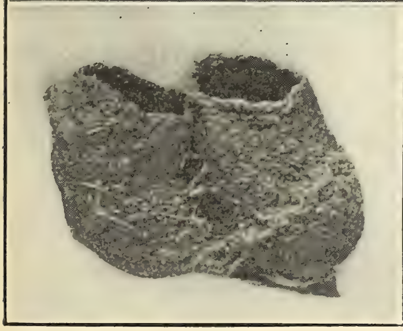


Fig. 3—Upper = Fig. 4—Lower





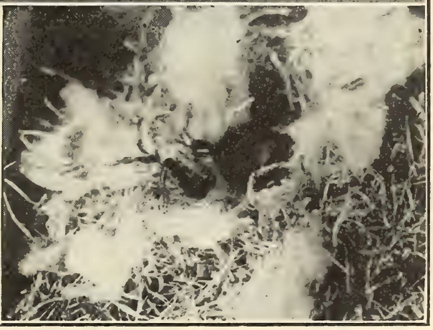


Fig. 5—Upper. Fig. 6—Lower, left. Fig. 7—Lower, right

ON SOME SPECIES OF PHAEDON.

By Chas. Schaeffer, Museum of the Brooklyn Institute,
Brooklyn, N. Y.

The species of the genus *Phaedon* have never before been thoroughly investigated and the correct identification of some of the species was always more or less troublesome. However, this has been recently remedied by the publication of three papers in the Pan-Pacific Entomologist, Vol. V, Nos. 1, 2, and 4. Two of these were published by Mr. Hatch in Nos. 1 and 2 in which he described nine new species. These were followed in No. 4 of the same publication by a paper of Mr. Fall, reviewing critically the two papers of Mr. Hatch and placing eight of the nine species described by the latter as new in synonymy of previously described species. Mr. Fall in his paper gave a good synoptic table for the identification of the species followed by notes on the different species characterizing also the species omitted by Mr. Hatch as unknown to the latter, which puts this formerly troublesome genus finally on a sound basis. However, the identification of two of our species as the European *cochleariae* and *armoraciae* was a mistake and I do not believe that the two occur here in North America.

Phaedon carri Hatch.
    Phaedon cochleariae Fall not Fab.

This species on comparisan with European specimens of *cochleariae,* with which it has been recently united by Mr. Fall, shows sufficient differences to entitle it to specific standing.

The European *cochleariae* is larger, the punctuation of all the elytral intervals is dual, that is, densely punctate with minute punctures and intermixed distinctly with larger punctures. Color is usually not of much importance, but no typical *cochleariae* nor any of its varieties are colored as *carri,* that is, dark bronze. Moreover, the coloration of the legs is variable in *carri,* the extreme of which, one specimen from New York, has the tarsi, tibiae, apex of femora and the first four antennal joints pale yellowish, in *cochleariae* no such variations are known. The sides of prothorax in *carri* are apparently also less arcuate and more straight than in *cochleariae.*

Phaedon americanus n. sp.

Phaedon armoraciae Hatch, Fall not Linné.

Oval, moderately convex, color dark olive green, last ventral segment more or less reddish. Head densely minutely punctulate with larger punctures intermixed, clypeus separated from front by an entire arcuate impression. Prothorax closely minutely punctulate with larger punctures intermixed, which are more numerous at sides than on disk, where they are also slightly smaller than those at the sides. Elytra slightly wider at base than the basal margin of prothorax; humeral callus prominent, separated internally by a rather deep impression; striae represented by rows of moderate punctures; intervals densely punctulate with very minute punctures with larger punctures intermixed on the first interval, which can be seen also more or less on the other intervals but very faintly, ventral segments microreticulate and punctate with moderately large punctures which are irregularly distributed over the first segment but situated near apical margin in a single transverse row on the following segments. Length 3.5 to 4 mm.

Marquette, Michigan (type), and in addition to the localities mentioned by Mr. Fall in his paper I have specimens from Coeur d'Alene, Idaho, and Kelso, Washington. The color varies a little in the specimens before me, some are slightly less darkly colored, others feebly bluish but none is so decidedly blue as most of the specimens of *armoraciae*.

This is the species identified by Mr. Hatch and Mr. Fall as the European *armoraciae*. While they are closely allied the punctuation of the elytral intervals at once separates them. In *armoraciae* all the intervals have a distinct dual punctuation consisting of very minute moderately closely placed punctures intermixed with numerous irregularly placed larger punctures which somewhat obscure the minute punctuation. In *americanus* the larger punctures when present on the intervals are not very distinct and seem to form an irregular row at middle of the intervals.

A NEW GENUS OF SEMI-AQUATIC HEMIPTERA.

By H. B. Hungerford, Department of Entomology, University, of Kansas, Lawrence.

For several years I have had in my possession a bug that was collected for me in Ecuador by my friend Doctor F. X. Williams. This insect to which I had assigned the manuscript name *Mesoveloidea williamsi* genus and species new has been most perplexing because it does not fit satisfactorily the diagnosis of any family and I have delayed describing it for that reason. Last year I took one of the specimens to Doctor Horváth in Budapest who examined it briefly and made the suggestion that it is probably nearer the genus *Mesovelia* than any other. These two interesting specimens were packed in with some Rhagovelias between layers of white velvet in a small pasteboard pill box. When they were mounted they were found to have lost some of their appendages. A search in the box was rewarded with the discovery of some parts which I believe must have belonged to these insects. I am submitting drawings of these parts. Fortunately some of the limbs were still attached to the insects.

One specimen is a winged female and is about the general size and shape of *Mesovelia bisignata* Uhler but in our keys it runs directly to Veliidae because of the anteapical position of the tarsal claws. The short head and venation of the hemelytra might place it near the *Microvelia* but the large scutellum and abdomen fashioned to accommodate an ovipositor for the insertion of the eggs into plant tissues promptly negate such a kinship. I am aware, of course, that the ovipositor may not be sufficient to remove it from the Veliidae for the *Rheumatobates* females insert their eggs in plant tissues while all the other Gerrids known to me do not. Nevertheless the possesion of a large exposed scutellum is not a characteristic of either the Veliidae or the Gerridae and lead me to assign the insect tentatively to the family Mesoveliidae. My specimens are not entire and the discovery of more individuals may assist in determining its proper relationship.

Mesoveloidea gen. n.

Small bugs having general shape of *Mesovelia* but with short declivent heads and the antenniferous tubercles close to the eyes. Beak long, slender and three segmented. Ocelli of winged form obsolete or lacking. Scutellum large, triangular and flat. A single median scent gland pore on the dorsum of the fourth abdominal segment as in *Mesovelia.* Female provided with an ovipositor for inserting eggs in tissues. Coxae elongate—middle pair midway between front and rear, the meta-coxae longest. Hind femora not attaining tip of ovipositor sheath. Front tarsi three-segmented with claws anteapical. Hemelytra membranous with three longitudinal veins the anterior one on the margin; three closed cells; two long slender cells in corium the second one slightly longer than the first and nearly divided; the distal cell reaching the middle of the membrane and ending in a strong vein that does not attain the margin of the membrane.

Mesoveloidea williamsi sp. n.

Size: Length 3.8 mm.; width across head .75 mm.; width across humeri 1.32 mm.

Color: Head and anterior one-fourth of the pronotum yellow, remainder of pronotum and scutellum metallic bluish black with a coppery sheen in sunlight. Hemelytra smoky with prominent veins brown. Thorax and abdominal venter purplish brown the thorax covered with a gray bloom. The basal abdominal segments smooth and shiny the genital segments pilose and lighter in color. Beak, antennae, acetabula and legs yellow—the acetabula slightly lighter.

Structural characteristics: Head with short vertex and declivent front, antennae arising close to margin of eyes. First antennal segment fairly stout, slightly curved and its distal end attaining the front of the humeri, as long as the lateral margin of the pronotum. Antennal formula: 1st: 2nd: 3rd: 4th::3:2.6:3.3:? Eyes small and coarsely facetted. Beak attaining the base of the hind coxae. Humeri of pronotum very slightly raised, lateral margins of pronotum straight, diverging from head to humeri, the margins rounded. Pronotum nearly flat. Scutellum triangular, flat—both clothed with short depressed pale hairs. Scutellum one-half length of pronotum and wider at base than long. Last dorsal abdominal segment broad and truncate at caudal end. Front legs short. Femur:tibia:tarsus::4.5:3.6:1.6. Front tarsus with terminal segment large and longer than the other two together. Hind femora in length are to the front femora as 7.5:4.5, and in diameter much greater. Limbs with some hairs but few spines.

Described from two female specimens from Mera, Ecuador, South America and taken by Doctor F. X. Williams Feburary

3, 1923. This species is the type of the new genus *Mesoveloidea.* Doctor O. M. Reuter in his "Neue Beiträge zur Phylogenie der Heteropteren Familien" removed the Mesoveliidae from a position with the families of semi-aquatics to one between the Reduviidae and Nabidae. This position has been followed by Van Duzee in his splendid catalog and by others in this country who have published manuals on the Hemiptera. Nevertheless, I believe this form to be a connecting link between the Mesoveliidæ and the Veliidae.

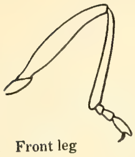
Concerning the region of Ecuador in which these most interest-insects were found, I am pleased to quote from a letter from my friend Doctor Williams: " Leaving Baños which is situated at 6000 feet on the east slope of the Andes, the trail further east lies along the Pastasa river as far as Mera, at 4,000 feet. At first the walking is pleasant as the path lies among granite or granite-like rocks. Here are some very large and beautiful terrestrial orchids, and as one descends, the tropics are becoming more and more apparent, for one can hardly call Baños tropical. Mera is a village of some 10 houses perched high up on the banks of the more or less navigable Pastasa, and is buried in virgin forest. It is an exceedingly wet region and the walking is mainly execrable. The palms about here have numerous rigid prop roots to meet the moist conditions. Little surface water bugs are found everywhere, even in footprints. Trees are loaded with epiphytes, particularly Araceae and Bromeliaceae. Some of the palms are 100 feet tall and only 8 or 9 inches thick at the prop roots."

Plate XXVII.

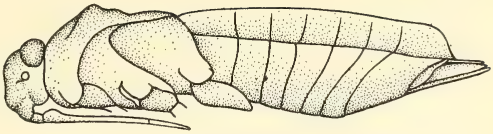
A New Genus of Semi-Aquatic Hemiptera.

Figure I. Front leg of *Mesoveloidea williamsi* genus and species new.
Figure II. Side view of female. Note the insertion of antenna below the eye and the character of the abdomen.
Figure III. Middle leg.
Figure IV. Hind leg.
Figure V. Hind tarsus.
Figure VI. *Mesoveloidea williamsi* genus and species new. Dorsal view. Note the short head, the flat scutellum, the wing venation and the dorsal abdominal scent gland pore.

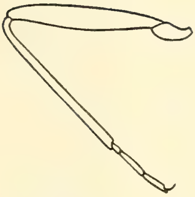
All of the above drawings, except Figure V, are made to the same scale by Miss Kathleen Doering.



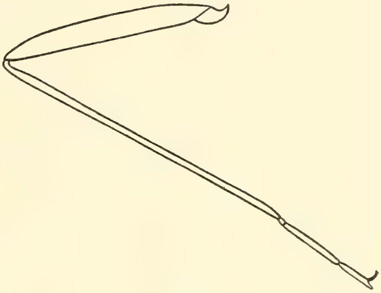
1 Front leg



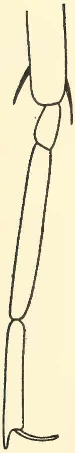
2 Mesoveloidea williamsi genus and species new



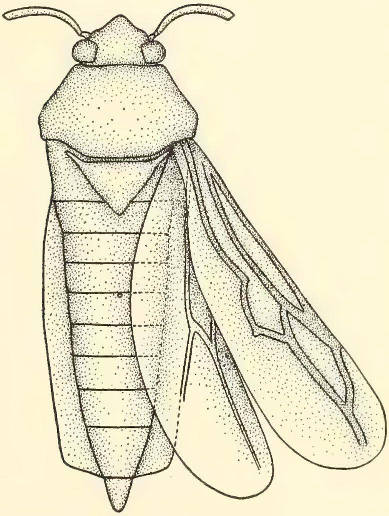
3 Middle leg



4 Hind leg



5 Hind tarsus



6 Mesoveloidea williamsi genus and species new

NEW NORTH AMERICAN SPECIES OF RHYNCHITES (COLEOPTERA).

By H. C. Fall, Tyngsboro, Mass.

Rhynchites quadripennis n. sp.

> Form stout, the elytra nearly square; above shining green with bronze or golden reflections; beneath black, feebly greenish; beak, legs and antennae black; pubescence black, erect.
>
> Beak and head strongly punctate and channeled, the former subequal in length to the head and thorax, the head narrow, subconical, a deep furrow between the eyes, the latter flatly convex and not prominent, separated on the front by about two-thirds their longest diameter.
>
> Prothorax as wide as long, a little widened posteriorly, a feeble apical constriction, sides moderately arcuate; disk moderately closely punctate and with an abbreviated median impressed line.
>
> Elytra broad, subquadrate, twice as wide and slightly more than twice as long as the prothorax; strial punctures coarse, intervals each with a single series of smaller but distinct punctures. Length (exclusive of beak) 3–3.5 mm.; width 1.75–2 mm.

Texas. Described from two examples, probably males, sent me many years ago as *hirtus*. If my memory serves me they were collected by Rauterberg and probably near New Braunfels.

In general appearance this species is most like *eximius* and *hirtus*. It agrees nearly with the former in color but differs decisively by the very long inflexed tooth of the tarsal claws. *Hirtus* has similarly toothed claws but the general form is more elongate, the color deep blue, the eyes more distant, the head without the deep interocular channel. In *quadripennis* the elytra are only about 1/10 longer than wide; in *eximius* the length is about ⅛, while in *hirtus* it is 2/5 to 1/2 greater than the width.

Rhynchites delectus n. sp.

> Small, rather stout, conspicuously widened posteriorly; viridi- or cupreoaeneous, shining, pubescence fine, grayish, semirecumbent.
>
> Beak 1/4 to 1/3 longer than the prothorax in the male, nearly as long as the elytra as a rule in the female; aeneous at base, piceous and often purpurescent beyond the antennal insertion; flattened and finely strigate between the antennal

fossae, more coarsely longitudinally rugulose in apical two-thirds. Head coarsely closely punctate without well defined median channel or fovea between the eyes, the latter separated by their own vertical diameter or slightly less.

Prothorax slightly longer than wide (as wide as long in some females), sides evenly arcuate, base and apex subequal; punctures coarse, deep and densely placed, the narrow shining intervals devoid of finer punctules.

Elytra twice as long as the thorax, distinctly inflated posteriorly, where they are nearly twice as wide as the latter; strial punctures rather coarse, intervals wider than the striae, each with a series of fine punctures. Length 1.85–2.5 mm.; width 1.1–1.35 mm.

Southern California: Pomona, Pasadena, Ojai Valley, Feb.–April. The type is a male from the first-named locality and bears date Feb. 22.

This little species is most nearly allied to *aureus,* which occurs also in the same region. *Aureus* is a rather larger and narrower species, the eyes much more distant, the prothorax with numerous fine interstitial punctures, the legs pale red.

Rhynchites aureus var. **levirostris** n. var.

Agrees with *aureus* in form, size, pubescence, eyes and dual punctuation of the thorax, but differs in being of a deep blue color with dark rufous legs, the beak polished and comparatively smooth, there being only a few relatively fine punctures and no longitudinal furrows or strigosity. Length 2.5 mm.; width 1.25 mm.

A single male taken by the writer in the San Bernardino Mts., California, July 14, 1892. With more material this form may prove to be specifically distinct.

Rhynchites insularis n. sp.

Nearly related to *aureus* but apparently distinct by the following characters:

The form is a little more elongate, strikingly so in the male type; the beak is very much shorter sex for sex, being in the male only as long and in the female but little longer than the thorax; the eyes in the male are notably more convex and prominent, the prothorax without fine interstitial punctuation; antennae pale rufous with black club; strial punctures of the elytra very coarse, the intervals almost everywhere narrower than the striae. In *aureus* the fine interstial punctures of the prothorax are a conspicuous feature of the sculpture, the antennae are dark metallic and the elytral interspaces are distinctly wider than the striae. Length (male type) 2.35 mm.; width 1 mm.

Described from a single pair, the male taken by myself on Santa Catalina Island, California, July 11, 1894. The female is from San Clemente Island and differs from the male only in the slightly longer beak, smaller eyes and somewhat less slender form. As in the average *aureus* they are both metallic bronze with pale legs.

A Note on the Habits of Hylemyia trivittata Stein—During September specimens of an anthomyid fly collected at Elba, N. Y., were forwarded to me for identification by Dr. Hugh Glasgow. They proved to be *Hylemyia trivittata* Stein. These flies were reported by Mr. Felix to be laying their eggs on the immature heads of wild lettuce in which the maggots fed on hatching. The plants recorded by Mr. Felix as infested were *Lactuca canadensis, L. spicata, L. scariola,* and *L. scariola* var. *integrata.* In the latter species 50 per cent of the seed heads was destroyed by what is believed to be injury by the maggot. Such information may be viewed with mingled feelings in the possibility it possesses for good or for evil for many of us. All power to the fly if it can help to reduce such common weeds around our gardens, but it will be a sad day when it is found that the seed heads of cultivated lettuce are also attacked. The fly is recorded by Stein as occurring in Washington State, and it is a common species in Eastern North America.—H. C. HUCKETT, Riverhead, N. Y.

Cryptocephalus Tinctus Lec.—My second specimen of this species turned up at Acton, Mass., on Sept. 15, 1929. It was taken by sweeping and the most conspicuous plants were low clusters of willow and oak. One specimen was taken in Sherborn, Mass., on Sept. 28, 1913, by sweeping bushes.—C. A. FROST, Framingham, Mass.

THE CRANE-FLIES OF NEW YORK: FOURTH SUPPLEMENTARY LIST.

By Charles P. Alexander, Amherst, Mass.

The third supplementary list of the crane-flies of New York was published in 1929 (Bulletin Brooklyn Ent. Soc., 24: 22–29). Since that date, a number of additional species have been added to the record. I wish here to list these species, to describe two novelties that are based partly on New York records, and to give a brief account of the Tipulid fauna of the Taconic State Park.

The additions to the list of New York crane-flies are as follows:

307 *Tipula mainensis* Alexander (Proc. Acad. Nat. Sci. Philadelphia, 1915: 475–476; 1915).
Hamilton County: Blue Mountain Lake, August 6, 1929 (G. C. Crampton).

308 *Limonia (Dicranomyia) iowensis* (Rogers) (Florida Entomologist, 9: 150–152; 1926).
Erie County: Hamburg, October 16, 1910 (M. C. Van Duzee).
Columbia County: Taconic State Park, dead in spider's webs, August, 1929 (C. P. Alexander).
Orange County: Tuxedo Park, August 27–28, 1928 (Curran and Edwards).

309 **Limonia (Dicranomyia) pudicoides** sp. n.
Hamilton County: Lake Piseco, altitude 1700 feet, September 2, 1929 (C. P. Alexander).

310 *Limonia (Geranomyia) distincta* Doane.
Fulton County: In a sphagnum bog, near Canada Lake, altitude 1700 feet, June 25, 1928 (C. P. Alexander).

311 **Pedicia margarita** sp. n.
Columbia County: Taconic State Park, August 12, 1929 (C. P. Alexander).

312 *Adelphomyia pleuralis* Dietz (Trans. American Ent. Soc., 47: 251–252; 1921).
Orange County: Tuxedo Park, June 30, 1928 (C. H. Curran).

313 *Dactylolabis supernumeraria* Alexander (Ent. News, 40: 46; 1929).
Essex County: Wilmington Notch, June 13, 1927 (C. P. Alexander).

314 *Limnophila* (*Dicranophragma*) *angustula* Alexander (Bull. Brooklyn Ent. Soc., 24: 190–191; 1929).
Columbia County: Taconic State Park, August 12, 1929 (C. P. Alexander).
Cortland County: Cincinnatus, July 20, 1916 (C. P. Alexander).
Fulton County: Woodworth's Lake, July 7, 1916 (C. P. Alexander).
Tompkins County: Ithaca, August 12, 1910 (C. P. Alexander).

315 *Limnophila* (*Ephelia*) *sabrina* Alexander (Bull. Brooklyn Ent. Soc., 24: 189–190; 1929).
Essex County: Keene Valley, May 26, 1920 (H. Notman).

316 *Limnophila* (*Prionolabis*) *walleyi* Alexander (Bull. Brooklyn Ent. Soc., 24: 187–188; 1929).
Rensselaer County: Brookview, June 15, 1923 (C. P. Alexander).

317 *Erioptera* (*Erioptera*) *viridula* Alexander. (Can. Ent., 41: 20; 1929).
Fulton County: Masten's Woods, Gloversville, altitude 900 feet, June 27, 1928 (C. P. Alexander).
Hamilton County: Ox-bow Lake, altitude 1700 feet, June 25, 1928 (C. P. Alexander).

318 *Molophilus laricicola* Alexander (Journ. New York Ent. Soc., 37: 55–56; 1929).
Fulton County: In a sphagnum bog, near Canada Lake, altitude 1700 feet, June 25, 1928 (C. P. Alexander).

Crane-flies taken at the Taconic State Park, Columbia County.

The Taconic Mountains undoubtedly support a very rich and varied crane-fly fauna. On September 12, 1928, Dr. Crampton, Mrs. Alexander and myself spent part of the day at the Park and at the beautiful Bashbish Falls just over the line in Massachusetts. At this time we decided to spend a longer period at the Park in 1929, a plan that was consummated in August, when Mrs. Alexander and I camped at the Park from August 9 to 24. The unprecedented droughts had made the entire country unnaturally dry and the number of crane-fly species was undoubtedly much reduced. I have included all records of species available and have added a few supplementary records of species secured by

Dr. Crampton on a two-day trip to the Park on May 25th and 26th, 1929.

The Bashbish stream is a densely shaded, rushing torrent of considerable size, plunging over tumbled rocks and boulders. The dominant forest cover is hemlock and yellow birch, with much mountain maple and striped maple. The steep mountain sides are densely covered with yew, from which many of the species listed were swept. The stream flows between Cedar and Bashbish Mountains, between altitudes of 700 and 900 feet. Most of the crane-flies recorded were swept from the steep springy slopes of Bashbish Mountain, at or close to the footpath to the Falls.

Tipula (*Cinctotipula*) *algonquin* Alexander. Aug. 9; a few on lower slopes of mountains.

Tipula bella Loew. Aug. 17, along stream.

Tipula cincticornis Doane. Sunset Rock, altitude 1200–1600 feet, Aug. 15.

Tipula fragilis Loew. Sept. 12, 1928.

Tipula hermannia Alexander. Common, August 10–20; Sunset Rock, altitude 1000 feet, Aug. 15.

Tipula hebes Loew. Common, August 12; Sunset Rock, altitude 1000 feet, Aug. 15.

Tipula trivittata Say. Aug. 13.

Tipula umbrosa Loew. Aug. 12.

Nephrotoma brevioricornis Doane. Aug. 13.

Nephrotoma ferruginea Fabricius. August 10–20.

Nephrotoma incurva Loew. Aug. 15.

Oropeza albipes Johnson. In crannies of cliffs, Aug. 9–20.

Oropeza obscura polita Johnson. In crannies, August 10–20.

Limonia (*Limonia*) *cinctipes* (Say). Aug. 12.

Limonia (*Limonia*) *globithorax* (Osten Sacken). May 25–26, 1929.

Limonia (*Limonia*) *pubipennis* (Osten Sacken). Aug. 12–20; Sept. 12, 1928.

Limonia (*Limonia*) *simulans* (Walker). Aug. 14.

Limonia (*Limonia*) *solitaria* (Osten Sacken). Aug. 10.

Limonia (*Discobola*) *argus* (Say). Sunset Rock, altitude 1000 feet, Aug. 15.

Limonia (*Rhipidia*) *maculata* (Meigen). Aug. 17.

Limonia (*Dicranomyia*) *humidicola* (Osten Sacken). (*badia* of authors, not Walker). Aug. 15–20; Sept. 12, 1928.

Limonia (*Dicranomyia*) *iowensis* (Rogers). Dead in spiders webs, Aug.

Limonia (*Dicranomyia*) *spinigera* Alexander. Sept. 12, 1928.

Limonia (*Geranomyia*) *diversa* (Osten Sacken). Aug. 12; Sept. 12, 1928.

Helius flavipes (Macquart). Aug. 9–12.

Dicranoptycha septentrionalis Alexander. Sunset Rock, altitude 1500 feet, Aug. 15.

Pedicia margarita sp. n. Aug. 12; the conditions under which this beautiful new species were taken have been discussed under its description.

Tricyphona auripennis (Osten Sacken). May 25; one male, resting on wet face of cliff (Crampton); the left wing of this specimen has cell M_2 open by the atrophy of *m*, the right wing being normal.

Tricyphona inconstans (Osten Sacken). Aug. 20.

Amalopina flaveola (Osten Sacken). Aug. 10–15.

Rhaphidolabis cayuga Alexander. May 25–26, 1929 (Crampton).

Rhaphidolabis rubescens Alexander. September 12, 1928.

Rhaphidolabis tenuipes Osten Sacken. Very abundant along streams, Aug. 9–20; Sept. 12, 1928.

Adelphomyia americana Alexander. Sept. 12, 1928.

Ula elegans Osten Sacken. Sunset Rock, altitude 1500 feet, Aug. 15; May 25–26, 1929 (Crampton).

Ula paupera Osten Sacken. Aug. 9–12.

Pseudolimnophila contempta (Osten Sacken). Aug. 10.

Limnophila (*Dicranophragma*) *angustula* Osten Sacken. Aug. 12.

Limnophila (*Limnophila*) *brevifurca* Osten Sacken. May 25–26.

Pilaria tenuipes (Say). Aug. 13.

Penthoptera albitarsis Osten Sacken. Common, Aug. 13–20.

Eriocera brachycera Osten Sacken. Along stream, both sexes, Aug. 17.

Eriocera spinosa Osten Sacken. Aug. 12.

Elephantomyia westwoodi Osten Sacken. Alander Mt., altitude 1000 feet, Aug. 16.

Cladura flavoferruginea Osten Sacken. Aug.; dead in spider's webs.

Lipsothrix sylvia (Alexander). May 25–26, 1929 (Crampton).

Gonomyia (*Gonomyia*) *bidentata* Alexander. Aug. 12.

Gonomyia (*Gonomyia*) *subcinerea* (Osten Sacken). May 25–26, 1929.

Erioptera (*Hoplolabis*) *armata* Osten Sacken. Aug. 14–16.

Erioptera (*Mesocyphona*) *caloptera* (Say). Aug. 20.

Erioptera (*Ilisia*) *venusta* Osten Sacken. Aug.; dead in spider's webs.

Erioptera (*Erioptera*) *septemtrionis* Osten Sacken. Aug. 9–20.

Erioptera (*Empeda*) *stigmatica* (Osten Sacken). Aug. 9–15; May 25–26.

Ormosia bilineata Dietz. May 25–26, 1929.

Ormosia meigenii (Osten Sacken). May 25–26, 1929.

Ormosia monticola (Osten Sacken). Aug. 12–20.

Ormosia nimbipennis Alexander. Aug. 9–20; Sept. 12, 1928.

Ormosia notmani Alexander. May 25–26, 1929.

Ormosia rubella (Osten Sacken). Sunset Rock, altitude 1000 feet, Aug. 15.

Molophilus hirtipennis (Osten Sacken). Aug. 17.

Molophilus pubipennis (Osten Sacken). Aug. 9–15.

Molophilus quadrispinosus Alexander. May 25, 1929 (Crampton).

Limonia (Dicranomyia) pudicoides sp. n.

General coloration pale yellow, including the scapal segments of antennae; wings pale yellow, the stigma lacking; male hypopygium with the rostral prolongation of the ventral dististyle a short blunt lobe that is entirely pale, shorter than the rostral spines.

Male.—Length about 6–6.5 mm.; wing, 6–6.5.

Rostrum pale, the palpi only a little darker. Antennae with the scape obscure brownish yellow, the flagellum a little darker. Head yellow, the anterior vertex narrow, more or less infuscated.

Thorax uniform reddish yellow, the pleura slightly clearer yellow. Halteres pale. Legs yellow, the outer segments only slightly darkened. Wings pale yellow, without stigma; veins darker yellow. Venation: Sc_1 ending opposite the origin of *Rs*, Sc_2 obsolete; cell *1st* M_2 closed; *m* and the basal deflection of M_3 pale, without macrotrichia.

Abdominal tergites brownish yellow, the hypopygium and sternites clearer yellow. Male hypopygium with the rostral prolongation of the ventral dististyle very short and blunt, entirely pale, bearing two relatively long spines that are placed close together at the summit of the prolongation; rostral spines exceeding the prolongation in length. Dorsal dististyle very strongly curved, the extreme apex a small hook. Gonapophyses with the mesal apical angle produced into a slender rod, terminating in an acute point, separated from the main body of the apophysis by a deep and narrow U-shaped notch.

Habitat: Eastern North America.

Holotype, ♂, Allardt, Fentress Co., Tennessee, altitude 1650 feet, August 9, 1924 (J. S. Rogers); Coll. No. 122.

Paratopotypes, ♂ ♀, July 21—August 9, 1924; paratypes, ♂, Clear Fork, near Burrville, Morgan Co., Tennessee, altitude 1200 feet, June 19, 1924 (J. S. Rogers); Coll. No. 5; 1 ♂, Lake Piseco, Hamilton Co., New York, altitude 1700 feet, September 2, 1929 (C. P. Alexander); 1 ♂, Lepreau Harbor, New Brunswick, September 21, 1929 (Donald Galbraith). Type returned to Professor Rogers.

This new species bears a conspicuous superficial resemblance to the species that has been passing in collections as *L.* (*L.*) *pudica* (Osten Sacken), differing very conspicuously in the details of structure of the male hypopygium.

Pedicia margarita sp. n.

Related to *albivitta* Walker; size small; dark markings on the wing narrow, the seam along vein *Cu* ending at near midlength of the distal section of Cu_1.

Male.—Length about 20–22 mm.; wing, 20–22 mm.

Female.—Length about 24 mm.; wing, 21.5–22 mm.

Rostrum gray; palpi black. Antennae 16-segmented, brown throughout; flagellar segments gradually decreasing in size outwardly; verticils longer than the segments, unilaterally arranged. Head gray, the vertical tubercle small.

Mesonotal praescutum gray, with four very pale reddish brown stripes, the intermediate pair more confluent behind; a dusky point immediately behind the transverse suture; scutum similar, the lobes with scarcely indicated reddish brown areas; scutellum pale yellow; postnotum gray with two contiguous oval reddish brown areas that occupy the posterior third. Pleura gray, the dorso-pleural region narrowly dark brown. Halteres pale, the knobs dusky. Legs with the coxae light gray, the outer ends and trochanters more or less infuscated; femora yellow, the tips conspicuously blackened, the amount subequal on all the legs; tibiae obscure yellow, the bases very narrowly, the tips more broadly blackened; tarsi passing into brown. Wings relatively narrow, whitish subhyaline, with the usual dark pattern of the genus; costal margin brownish yellow, much paler than the remainder of the dark pattern; seams along *Cu* and the cord unusually narrow, the former ending at about midlength of the distal section of Cu_1, not attaining the wing-margin.

Abdominal tergites gray, paler gray laterally, darker brownish gray medially, the segments variegated with light orange castaneous near posterior margin; median dark stripe narrowed outwardly, becoming blackened and obsolete on tergite seven; sternites chiefly orange, gray laterally, the outer segments becoming more pruinose. Male hypopygium with the dististyle elongate, a little dilated at outer end, at the widest portion with a small group of black setae on inner face. Basistyle produced dorsad into a flattened black blade, the apex truncate.

Habitat: Northeastern North America.

Holotype, ♂, Orient Springs, Hampshire Co., Massachusetts, altitude 375 feet, July 29, 1929 (C. P. Alexander).

Allotopotype, ♀.

Paratopotypes, 2 ♂ ♂; additional material in the British Museum, collected in early August, 1928, by Edwards and Rogers; paratypes, 1 ♂, Bashbish Falls, Berkshire Co., Massachusetts, altitude about 900 feet, August 20, 1929 (M. M. Alexander); 1 ♂, Taconic Park, Columbia Co., New York, altitude about 750 feet, August 12, 1929 (C. P. Alexander). Type in the author's collection.

Pedicia margarita is named in honor of my wife, who collected one of the type specimens. The species is quite distinct from *albivitta,* being smaller in both sexes, with the dark wing-pattern more restricted and with an incomplete darkened spur along vein *Cu* that does not reach the wing-margin. The details of structure of the male hypopygium are similarly distinct. The three species of *Pedicia* inhabiting Northeastern North America may be separated by means of the following key, based on the pattern of the wing:

1. Dark seam along vein *Cu* not extending distad beyond the approximate level of the cord.........*contermina* Walker
   Dark seam along vein *Cu* extended distad onto the outer section of vein Cu_1.......................................2

2. Dark seams along *Cu* and the cord broad, the former extending the entire length of the vein, attaining the wing-margin. *albivitta* Walker

Dark seams along *Cu* and the cord narrow, the former ending at about midlength of the outer section of vein Cu_1, not attaining the wing-margin................**margarita** sp. n.

The material upon which this species is based was first recognized as being an undescribed species by Mr. Fred W. Edwards, of the British Museum of Natural History, who collected specimens at the Orient Springs, in company with Professor J. Speed Rogers and the author. Mr. Edwards suspicions at the time that this smaller, more delicate *Pedicia* was a distinct species from *albivitta* were confirmed upon comparison with the type-specimen of the latter in the British Museum. At the Orient Springs, the types of *margarita* occurred on a springy hillside, shaded by hemlock and yellow birch. This particular restricted station supports all three of the regional species of *Pedicia, contermina* being the earliest, flying in May and June. In July and August, *albivitta* and the present species are on the wing, sometimes being found flying together. On July 29, 1929, I made a special trip to this station in order to secure further material of *margarita* and hard collecting during the entire afternoon produced four individuals of the new species but no *albivitta.* At Taconic Park, along the Bashbish stream, the additional specimens of *margarita* here recorded were found under conditions that were very like those obtaining at Orient Springs, the stream being shaded chiefly by hemlock and yellow birch and fed by abundant springs from the adjoining mountain side. The specimen taken by Mrs. Alexander was at the great pool at the foot of Bashbish Falls, the specimen being observed to fly lazily across the pool from a nearby wet cliff.

BEES OF THE SUB-FAMILY OSMINAE IN THE COLLECTION OF THE BRIGHAM YOUNG UNIVERSITY.[1]

By D. Elden Beck.

It is always necessary in beginning a study of the fanua of a region to collect and determine the species of the group or groups being considered. Since very little has been published on the Hymenoptera of the Great Basin the writer feels that the following list of thirty-six species of Osminae will be of interest to students of the Apoidea. The writer has under way a morphological study of various species of many genera of the Apoidea.

The species discussed in this paper are specimens collected from Utah and contiguous states, most of which are within the Great Basin Region. So far as the writer has been able to determine only fifteen species of Osminae have been reported from Utah, these by Professor T. D. A. Cockerell and Miss Grace A. Sandhouse now at the U. S. National Museum. The remaining twenty-one species are apparently new records for Utah. Species marked with an asterisk have been previously reported.

The writer is indebted to Miss Grace A. Sandhouse and Dr. Vasco M. Tanner who have determined and verified many of the species of this list.

Sub-family Osminae.

1. *Osmia albolateralis* Cockerell.

Utah: 1 ♀ Bryce Canyon (Vasco M. Tanner); 1 ♀ Bears Ears, San Juan Co. (Tanner).

2. *Osmia abnormis* Cresson

Utah: 1 ♀ 6 ♂ Rosevere Creek, Raft River Mountains (Tanner) (D. Eldon Beck); 1 ♂ La Sal Mountains (James Kartchner).

*3. *Osmia cobaltina* Cresson.

Utah: 2 ♀ Zion National Park (Tanner); 1 ♀ La Sal Mountains (Anson Call); 1 ♀ Aspen Grove, Mt. Timpanogos (Tanner); 1 ♀ Rosevere Creek, Raft River Mts. (Tanner).

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[1] Contribution No. 21 from the Zoological Laboratories of the Brigham Young University, Provo, Utah.

ARIZ.: 1 ♀ Kaibab Forest (Anson Call).

WYO.: 1 ♀ Fort Bridger (Clarence Cottam).

*4. *Osmia coloradensis* Cresson.

ARIZONA: 1 ♀ Rim Grand Canyon, Kaibab Forest (Tanner).

*5. *Osmia fulgida* Cresson.

UTAH: 1 ♀ Bears Ears (Call).

6. *Osmia giliarum* Cockerell.

UTAH: 1 ♀ Logan Canyon (Tanner); 1 ♀ Glendale (Tanner).

7. *Osmia integra* Cresson.

UTAH: 7 ♂ Provo Bench, Provo (D. Elden Beck).

8. *Osmia inurbana* Cresson.

UTAH: 1 ♂ Rosevere Creek, Raft River Mts. (Beck).

9. *Osmia leonis* Cockerell.

UTAH: 1 ♀ Zion National Park (Tanner); 1 ♀ Dividend, Eureka (Tom Spalding).

10. *Osmia longula* Cresson.

UTAH: 1 ♀ Woodside (Kartchner).

COLORADO: 1 ♀ Mesa Verde National Park (Call).

*11. *Osmia melanotricha* Lovell and Cockerell.

WYOMING: 3 ♀ Burnt Fork (C. Lynn Hayward & Tanner).

*12. *Osmia nassa* Cockerell.

UTAH: 1 ♀ Summit Danials Canyon, near Heber (Hayward).

*13. *Osmia mandibularis* Cresson.

UTAH: 1 ♀ Sheep Creek, Duchense Co. (Claudeous J. D. Brown); 6 ♀ Wandship (Tanner & Beck).

COLORADO: 1 ♀ Mesa Verde National Park (Tanner).

14. *Osmia bucephala* Cresson.

UTAH: 1 ♂ La Sal. Mts. (Call).

15. *Osmia armaticeps* Cresson.

UTAH: 1 ♀ Rosevere Creek, Raft River Mts. (Tanner); 1 ♀ Bears Ears (Irvin Rasmussen).

IDAHO: 1 ♀ Lava Hot Springs (Beck).

16. *Osmia atrocyanea* Cockerell.

Utah: 1 ♀ Wellsville Canyon (Tanner).

17. *Osmia kenoyeri* Cockerell.

Colorado: 1 ♀ Mesa Verde National Park (Call).

18. *Osmia penstemonis* Cockerell.

Utah: 1 ♀ Bryce Canyon (Rasmussen).

19. *Osmia proposita* Sandhouse.

Utah: 1 ♀ Bears Ears (Tanner).

20. *Osmia texana* Cresson.

Utah: 1 ♀ Logan (Hayward).

21. *Osmia cyanella* Cockerell.

Utah: 1 ♀ Logan Canyon (Tanner); 1 ♀ Wellsville Canyon (Tanner).

*22. *Osmia wardiana* Cockerell.

Utah: 8 ♀ Provo Bench, Provo (Beck); 1 ♀ Bears Ears, San Juan Co. (Tannen); 1 ♀ Sheep Creek, Duchense Co. (Tanner); 1 ♀ Raft River Mts. (Tanner).

Colorado: 1 ♀ Mesa Verde National Park (Tanner).
Nevada: 3 ♀ Lehmans Cave, Mt. Wheller (Tanner).

23. *Osmia tristella* Cockerell.

Utah: 1 ♀ Rosevere Creek, Raft River Mts. (Tanner).

24. *Osmia nigrafrons* Cockerell.

Wyoming: 1 ♀ Burnt Fork (Hayward).

25. *Osmia permorata* Cockerell.

Utah: 2 ♀ Provo Bench, Provo (Beck).

26. *Osmia pascoensis* Cockerell.

Utah: 1 ♀ Sheep Creek (Tanner).

*27. *Osmia lignaria* Say.

Utah: 1 ♀ 1 ♂ Zion National Park (Tanner); 1 ♂ 4 ♀ Pine Valley Mt. (Tanner); 9 ♀ Spanish Fork (Beck); 1 ♂ 13 ♀ Provo (Tanner; John Allen Rowe; Hayward; Herman L. Thomas; O. Wilford Olsen; Call; Beck); 1 ♀ Utah Lake (Olsen); 1 ♀ Wellsville Canyon (Hayward); 1 ♀ Deep Creek Mts. (Tanner); 2 ♀ Rosevere Creek, Raft River Mts. (Tanner); 1 ♀ Bear Lake Valley (Hayward).

IDAHO: 1 ♂ 1 ♀ Lava Hot Springs (Beck); 1 ♀ Driggs (Kartchner); 1 ♀ Moscow (Joseph Sudweeks).

The following six species of *Osmia* were reported by Miss Sandhouse (Calif. Acad. of Sciences, 4th series, Vol. XIII, No. 22, 1924); but are not in the B. Y. University Collection.

*28. *Osmia subpurpurea* Cockerell.

UTAH: 2 ♀ Salt Lake City (E. P. Van Duzee).

*29. *Osmia phaceliae* Cockerell.

UTAH: 1 ♀ Park City (Van Duzee); 2 ♀ Vivian Park (Van Duzee).

*30. *Osmia cyanosoma* Cockerell.

UTAH: 1 ♀ Danials Canyon, Heber (Van Duzee); 1 ♀ Vivian Park (Van Duzee).

*31. *Osmia subornata* Cockerell.

UTAH: 1 ♀ Park City (Van Duzee).

*32. *Osmia nifoata* Cockerell.

UTAH: 1 ♀ Park City (Van Duzee).

*33. *Osmia Wilmattae* Cockerell.

UTAH: 8 ♀ Park City (Van Duzee); 4 ♀ Vivian Park (Van Duzee); 1 ♀ Logan (Van Duzee); 2 ♀ Salt Lake City (Van Duzee).

34. *Monumetha albifrons* Kirby.

UTAH: 5 ♀ Bryce Canyon (Call, Rasmussen); 2 ♀ Aspen Grove Mt. Timpanogos (Tanner); 2 ♀ Sheep Creek, Duchense Co. (Brown & Tanner); 2 ♀ Flaming Gorge (Tanner); 1 ♀ Deep Creek Mts. (Tanner); 1 ♀ Rosevere Creek, Raft River Mts. (Tanner); 1 ♀ Logan Canyon (Clarence Cottam).

34. *Monumetha alibifrons* Kirby.

COLORADO: 4 ♀ Mesa Verde National Park (Tanner & Kartchner).

WYOMING: 1 ♀ Burnt Fork (Hayward).

35. *Monumetha fulgida* Cresson.

UTAH: 1 ♀ Provo Bench, Provo (Beck).

NEW MEXICO: 1 ♀ Ship Rock (Kartchner).

COLORADO: 4 ♀ Mesa Verda National Park (Tanner).

*36. *Alcidamea hypocrita* Cockerell.

UTAH: 2 ♀ Wellsville Canyon (Tanner).

GENUS DIKRANEUROIDEA GEN. N. (HOMOPTERA, CICADELLIDAE).

BY PAUL B. LAWSON, University of Kansas, Lawrence.

Dikraneuroidea gen. nov.

Small leafhoppers with head and entire body strongly flattened. Ocelli lacking. Tegmina lacking anteapical cells and appendix; the second of the four apical cells strongly pedunculate; apex broadly rounded. Hind wing with submarginal vein distant from margin and running into costal margin; first and second sectors uniting so that there is but one closed submarginal cell.

This genus seems to be closer to the genus *Dikraneura* than to any other. *D. cockerellii* Gillette, for example, has much the general appearance of the species described below but has two closed submarginal cells in the hind wing whereas this genus has only one.

The erection of this genus seems necessary to accommodate the following species:

Dikraneuroidea beameri sp. n.

A milky-white species strikingly marked with two red parallel lines and small red dots on each tegmen. Length 2.5–2.75 mm.

Vertex slightly longer than broad, margins convex in front of eyes, forming slight notch at junction with them. Pronotum about as long as vertex, distinctly widened posteriorly. Elytra greatly exceeding abdomen, rounded apically, second and fourth apical cells distinctly triangular, third cell rectangular and parallel-sided, transverse veins practically in a straight line.

Last ventral segment of female twice as long as preceding, posterior margin sinuate and produced, with large rounded lobe on median third; pygofer long, sparsely spined and exceeded by ovipositor. Valve of male hidden; plates triangular, very long, tapering in ventral view to very acute apices which strongly exceed the pygofer, lateral aspect of apices broadly rounded.

Color: Margins of vertex milky-white, disc hyaline and tinged with orange or yellow. Pronotum milky-white with median orange or yellow stripe. Scutellum white, the three angles sometimes yellow. Elytra milky-white nearly to cross veins, apical cells hyaline and slightly fumose, marked as follows: An orange-red, oblique, club-shaped band near the base, starting on costal margin and nearly reaching clavus; an orange-red irregular and broken band, parallel to the first band, and extending across corium toward tip of clavus; a larger orange-red spot and a number of smaller bright red spots on posterior half of clavus and a number of small red ones on both sides of posterior orange-red band; a red dot at junction of costa and first cross vein from which extends a more or less distinct, narrow, smoky band along cross veins; a small black dot just cephalad of the forked apical vein and a smaller one near inner angle of fourth apical cell. Dorsum white. Entire under surface yellowish white but with red line below white margins of vertex and on sides of pro- and mesothorax.

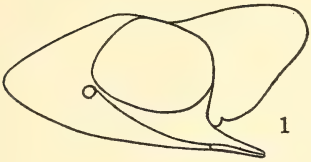
Holotype, female, allotype and numerous paratypes, were all taken by Doctor R. H. Beamer, after whom the species is named, on the undergrowth in the palm forest about seven miles southeast of Brownsville, Cameron County, Texas, Aug. 3, 1928. All types deposited in the Snow Entomological Collection.

Plate XXVIII.

Explanation of Figures.

1. Lateral view of head.
2. Dorsal view of head and prothorax.
3. Tegmen.
4. Hind wing.
5. Female genitalia.
6. Male genitalia.
7. Tip of male pygofer showing pygofer hook.
8. Dorsal aspect male internal genitalia.
9. Lateral view of oedagus.

Eurymus interior Scud.—A male *E. interior* Scud., was taken on the summit of Carter Dome in New Hampshire, August 3, 1927. This species does not appear to be frequently reported by New England collectors. The specimen was in a somewhat rubbed condition, possibly due in part to the inhospitable altitude in which it existed.—W. Prescott Rogers, Fall River, Mass.



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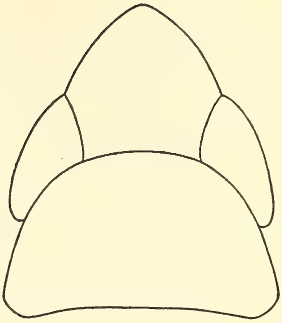

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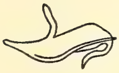

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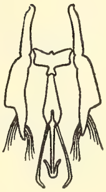

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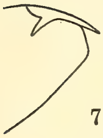

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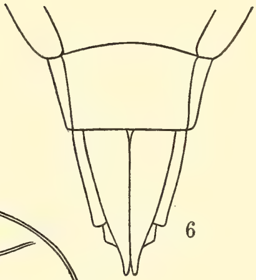

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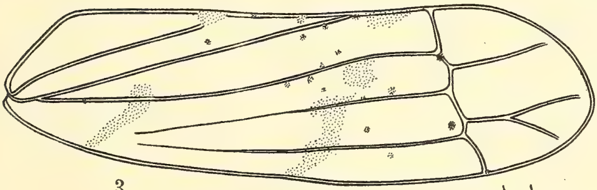

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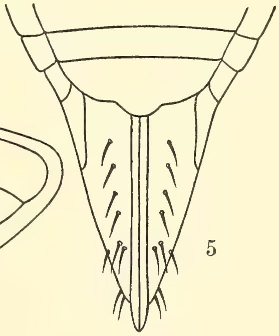

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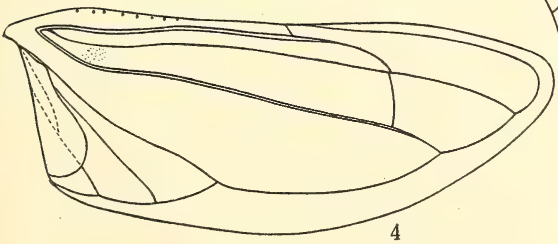

4

ON SOME NEW ENGLAND HETEROPTERA.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Mr. C. A. Frost, of Framingham, Mass., for some years past has most kindly favored me with his catch of Heteroptera from New England. Last year and early this spring, he sent me several small lots, which make up in interest for what they might appear to lack in quantity. And lately, he sent me his Maine catch.

His specimens are always accompanied by data; and to these I add what comment may appear necessary regarding each species. The arrangement of the families, for convenience in reference, follows the Van Duzee Catalogue; and that of the genera and species follows Hemiptera of Connecticut, our standard manual for the Heteroptera of the North Eastern United States.

The Massachusetts records follow:

Amnestus spinifrons Say, 1 specimen from Southboro, May 5, 1928, a new Massachusetts locality.

Dendrocoris humeralis Uhler, 1 specimen from Natick, May 27, 1928, another new locality for the state.

Aradus cinnamomeus Panzer, 1 specimen by sweeping, Natick, July 15, 1928. This is the first New England record of the species from a definite locality, although Parshley gives it as from " Mass." in Can. Ent., LIII: 235 (1921). The manner of capture also is odd, as the specimen is a stenopterous male.

Neides muticus Say, 1 specimen from Middlesex Fells, July 31, 1928, a new locality for the state.

Jalysus spinosus Say, 2 from Nantucket, September 11, 1928, another new locality.

Ischnorhynchus resedae Panz., Framingham, November 11, 1928; sifted.

Cymus angustatus Stål, Framingham, March 24, 1928; sifted.

Cymus discors Horváth, same data. New locality for the State.

Hypogeocoris piceus Say, 1 from Natick, October 12, 1928, sifted from piles of dry grass and weeds. New locality.

Crophius disconotus Say, 1 specimen, sifted, Natick, October 14, 1928. Another new locality.

Myodochus serripes Olivier, 1 specimen, same data; also a new place.

Orthaea basalis Dallas, 5 specimens, Natick, October 12, 1928; also sifted from grass piles; another new locality for the State.

Zeridoneus costalis Van Duzee, 1 only from Natick, October 14, 1928. Also a new locality for the State.

Antillocoris pallidus Uhler, 2 specimens, sifted, Framingham, March 24, 1928.

Drymus unus Say, Natick, October 12, 1928, 1 sifted from grass piles. Another new State locality.

Xestocoris nitens Van Duzee, same data; also a new locality.

Corythucha mollicula O. & D., 1 from Middlesex Fells, July 31, 1928; a new locality.

C. cydoniae Fitch, 3 specimens, same data; another new locality.

C. elegans Drake, Natick, November 12, 1928; also sifted from piles of grass. This appears to be not only the first Massachusetts record, but also the first New England record.

C. arcuata Say, 1 from Middlesex Fells, July 31, 1928, another new locality for the State.

C. pergandei Heidemann, 8 from Framingham, May 5, 1928. A new place.

C. marmorata Uhler, 1 from Natick, July 4, 1928, which is another new locality.

Leptobyrsa rhododendri Horváth, 1 from Cambridge, Mass., collected by Dr. J. C. Emerton; a new locality.

Gelchossa heidemanni O. & D., Natick, June 10 and July 29, 1928; in quantity on *Baptisia tinctoria*, as usual; but a new locality.

Physatocheila plexa Say, 1 from Sherborn, July 7, 1928. This appears to be a new record for the State, for Parshley, in his Hemiptera of New England gives it as found only in Rhode Island, although Van Duzee in his Catalogue lists it from Maine.

Ploiariodes errabundus Say, 1 from Nantucket, September 11, 1928. This is a new Massachusetts locality.

Metapterus annulipes Stål.

M. fraternus Say, 1 each of these species, both sifted at Natick on October 12, 1928, from piles of grass and weeds. Both are likewise new State records.

Rhynocoris ventralis Say, 1 specimen from Natick, July 8, 1928; the only other record from Massachusetts seems to be the original from Framingham, also a capture by Mr. Frost.

Nabis ferus Linné, 1 from Cambridge, collected by Dr. Emerton, a new Massachusetts locality.

N. roseipennis Reuter, 1 from Sherborn, November 25, 1928 sifted; a new locality for the State, and 1 from Natick, May 13, 1928, another new locality, also sifted.

Lyctocoris campestris Fabricius, 1 from Southboro, May 16, 1928. This species does not seem to have been heretofore recorded from Massachusetts.

Anthocoris borealis Dallas, 2 specimens, sifted, Framingham, November 29, 1928. Apparently this species has been recorded only once from the State, from Peru.

Hydrometra martini Kirkaldy, quite a number from a woodland pool at Natick, on May 26, 1928; a new locality.

Gerris marginatus Say, 1 sifted at Sherborn, November 25, 1928; which is another new locality for the species.

Saldula saltatoria Linné, 1 from Framingham, March 24, 1928, sifted. This species is questioned by Parshley in Hemiptera of New England, although he gives several records in Massachusetts, the present being a new locality. A number of mirids came with these, but they have been reserved for study by Dr. H. H. Knight, who will report on them later.

The more interesting Heteroptera from Mr. Frost, however, are those that he secured at Paris and South Paris, Maine. As will be seen, not only are some of them new records for the State, but there are also some which enormously extend the distribution of certain of the species.

Euschistus tristigmus Say, Paris, June 11, 1929, a single specimen from a new locality in the State.

Nysius californicus Stål, 2 from South Paris, September 20, 1928, and 2 from Paris, July 11, 1929. According to Blatchley, this species extends from Connecticut south; Parshley, in Hemiptera of Connecticut states that it reaches its northern limits in the southern New England States. This, therefore, is not only a new record for New England, but it also extends to a great degree the distribution of this species, which is now seen to occur from Mexico and Florida north to the Dakotas and Maine, from ocean to ocean.

Nysius thymi Wolff, 1 from Paris, July 11, 1929, a new locality in the State.

Drymus unus Say, 2 from South Paris, September 26, 1928, a new locality, as is also the following species.

Eremocoris ferus Linné, same data, 1 specimen.

Scolopostethus diffidens Horváth, 1 specimen, same data. This is the first definite locality in Maine, although Parshley in Fauna of New England records it as from "Maine."

Plinthisus compactus Uhler, 1 specimen, same data as above. This appears to be a new record not only for the State, but for New England, as well. Parshley gives it as found in New Hampshire and Massachusetts only.

Sphaerobius insignis Uhler, same data; a new State locality.

Ranatra nigra (H. S.) Hungf., an adult and a nymph from the Little Androscoggin River, South Paris, September 20, 1928. This is a new record for New England. Parshley gives it from Massachusetts, but from no other State, under the name of *R. protensa* Montandon.

These few records, useful in advancing an adequate knowledge of our American Heteropterous fauna, indicate the desirability of securing specimens from uncollected places. This coleopterists can well aid in, since by the same methods that Coleoptera are secured, many Heteroptera will be found. And echo answers "Et tu quoque."

Eurymus eurytheme Bdv.—Stray specimens of *E. eurytheme* Bdv., have been noted occasionally in southern Massachusetts during the past three seasons, a male at Acoaxet on August 14, 1927, another on the links of the Fall River Country Club, October 16, 1927. In 1928 at Acoaxet on August 27 a high-colored male specimen was taken. During 1929 two specimens were noted, September 5th, at Acoaxet and on September 12th at the Fall River Country Club.—W. Prescott Rogers, Fall River, Mass.

TWO UROTHRIPIDÆ (THYSANOPTERA) FROM FLORIDA, WITH KEYS TO THE KNOWN GENERA AND THE NORTH AMERICAN SPECIES.

By J. Douglas Hood, University of Rochester.

Professor J. R. Watson has sent me recently some very interesting Urothripidæ collected by several of his associates at the University of Florida and the Florida Agricultural Experiment Stations. One of the species is represented by a considerable series from various localities within the state, and is apparently generically as well as specifically new. The other is less numerous in the collections, and is a species described in 1925 by Mr. C. B. Williams and myself from the West Indies; its occurrence in tropical United States had been expected. Both, then, are additions to the North American list; and representing as they do one of the smallest and most obscure families of the Thysanoptera—a family unknown from the New World until little more than four years ago—it has been thought worth while to include keys to the genera of the world and to the three North American species.

Superfamily Urothripoidea.

1912. (April 13). ["A new suborder"] Hood, Proc. Biol. Soc. Wash., Vol. XXV, p. 64.
1912. (August). [Suborder] *Polystigmata* Bagnall, Ann. Mag. Nat. Hist., Ser 8, Vol. 10, p. 220.
1915. Superfamily *Urothripoidea* Hood, Proc. Biol. Soc. Wash., Vol. XXVIII, p. 59.
1927. Superfamily *Urothripoidea* Hood, Ann. Ent. Soc. Amer., Vol. XX, p. 2.

The Urothripoidea are a compact and easily recognizable group of Thysanoptera. Two misobservations have led, however, to an exaggerated belief in their distinctness: They do not have eleven stigmata and the maxillary palpi are not one-segmented. The number of stigmata is four, which is typical of the entire order, while the number of segments in the maxillary palpi is the same as in all other Tubulifera, i.e., *two,* as has previously, but not conspicuously, been stated.[1]

If we recognize the group as a superfamily or family, we must seek content in a meagre assortment of differences, of which only one is positive and possessed by no other Tubulifera. Perhaps additional characters may in time be found; but at present the only important one is the distance between the coxæ of the hind pair, this distance being greater than that separating either of the others. In the rest of the Tubulifera the middle coxæ are the most widely separated, due merely to the greater development of the mesothorax, which bears in winged species the larger and more powerful fore wings. The apterous condition of the urothripids is apparently so ancient as to have caused a great reduction in the size of the thorax, the mesothoracic coxæ inevitably coming closer together, but the hind coxæ remaining or becoming widely separated because of the necessity for supporting the long heavy abdomen, with the particularly long hairs at its tip.

The sculpture of the body surface is distinctive, to be sure, and furnishes a secondary character of real value; but this difference is not convincingly fundamental, any more than is the apparently invariable absence of wings (wings are lacking in many other Thysanoptera), or the reduction in the number of segments in the antennæ (species of other families have as few antennal segments as some of the urothripids), or the longer hairs at the tip of the abdomen (*Karnyothrips,* a phlæothripid, has hairs nearly as long).

In almost every group of insects the immature stages furnish valuable clues to relationships; and it must be disappointing to those who apparently believe in raising all of the overly numerous families of the order to superfamily rank, to find that the urothripoid nymph indicates a close relationship, indeed, to the phlæothripoids, as a study of the last three figures on the plate accompanying this paper will show.

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[1] Hood, Ann. Ent. Soc. Amer., Vol. XX, p. 2 (line 7 from bottom); 1927. See also figure 3 of the plate accompanying the present paper, in which is shown the small basal segment which has quite generally been overlooked.

FAMILY UROTHRIPIDÆ.

1909. *Urothripidæ,* Bagnall, Ann. Mus. Nat. Hung., Vol. VII, p. 126.
1910. *Urothripidæ,* Bagnall, Fauna Hawaiiensis, Vol. III, Pl. VI, p. 677.
1911. *Urothripidæ,* Bagnall, Ier Congs. Int. d'Ent., p. 283.
1912. *Urothripidæ,* Trybom, Arkiv f. Zool., Bd. 7, No. 33, p. 31.
1915. *Urothripidæ,* Hood, Proc. Biol. Soc. Wash., Vol. XXVIII, pp. 54, 59.
1927. *Urothripidæ,* Hood, Ann. Ent. Soc. Amer., Vol. XX, p. 3.

KEY TO GENERA.

I—Antennæ 7-segmented.

a. Vertex of head without prominent bristles; antennal segments 3–5 about as wide as long; tube much shorter than head, relatively stout, three to five times as long as greatest width, with six long hairs at tip. Ethiopian.............*Urothrips* Bagnall.

aa. Vertex of head with a pair of prominent, anteriorly-directed bristles; antennal segments 3–5 decidedly longer than wide; tube much longer than head, very slender, fully ten times as long as greatest width; with four long hairs at tip. Neotropical *Bradythrips* Hood and Williams.

II—Antennæ either 4- or 5-segmented.

b. Antennæ 5-segmented.

c. Vertex of head without prominent bristles; antennal segments 4 and 5 not closely united, 5 pedicellate.

d. Head as broad as long; fore tarsi apparently unarmed; tenth abdominal segment much longer than ninth, which is only slightly longer than eighth; tip of abdomen with four long hairs. Palæarctic................*Bebelothrips* Buffa.

dd. Head decidedly longer than broad; fore tarsi with a prominent, curved, claw-like structure on the outer surface; tenth abdominal segment subequal in length to ninth, which is about twice as long as eighth; tip of abdomen with six long hairs. Nearctic...**Trachythrips** Hood.

cc. Vertex of head with 4 to 6 prominent bristles, borne on conspicuous tubercles; antennal segments 4 and 5 compactly united, 5 conical, not at all pedicellate; ninth abdominal segment fully twice as long as eighth; tip of abdomen with six long hairs. Nearctic, Neotropical, and Ethiopian.
Stephanothrips Trybom.

bb. Antennæ 4–segmented; tip of abdomen with four long hairs. Palæarctic........*Amphibolothrips* Buffa.

Trachythrips gen. nov.

(τραχύς, rough; θριψ.)

Antennæ five-segmented; segments 4 and 5 not closely united, 5 pedicellate. Head decidedly longer than broad; vertex without prominent bristles. Fore-tarsi with a prominent, curved, claw-like structure on the outer surface. Abdomen with tenth segment subequal in length to ninth, which is about twice as long as eighth; tip of abdomen with six long hairs.

Genotype: Trachythrips watsoni sp. nov., from Florida.

This genus is no doubt closely related to *Bebelothrips* Buffa, to which belongs only one species, known from three specimens taken more than twenty years ago on the island of Giglio, off the western cost of Italy. Buffa's description and figures[1] are of a much broader insect, with the tenth abdominal segment much longer than the ninth (which is only slightly longer than the eighth) and with four long hairs, instead of six, at the tip of the abdomen.

Trachythrips watsoni sp. nov. (Pl. XXIX, figs. 1–9.)

Female (apterous).—Length about 1.2 mm. Color straw yellow, with head, prothorax, mesothorax, fore legs, and extreme tip of tube, dark brown; abdominal segments 2–8 each with a pair of round dorso-lateral pale-brown spots smaller than the first antennal segment; median line of abdomen faintly indicated by a series of light gray blotches; antennæ straw yellow, shaded with brown distally; tarsi with the usual

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[1] Boll. Lab. Zool. R. Scuola Sup. Agr., Portici, Vol. III, pp. 195 and 196; 1909.

darkened tip; ninth segment of abdomen narrowly darkened with brown along lateral surface; subhypodermal pigmentation of two kinds, i.e., bright crimson and white; the former generally distributed in the head and thorax (but more abundant at sides and along front margin of prothorax), underlying the dorso-lateral abdominal spots, and sparsely distributed in legs and beneath the faint median abdominal blotches; the white pigmentation opaque, conspicuous when observed by reflected light, forming a broad band across metathorax and disposed in two series of blotches on abdominal segments 1–6, one such series lying along the extreme lateral margin external to the brown spots and to the crimson pigmentation, the other just laterad of the median line.

Head about 1.2 times as long as wide, broadest at about one-fourth from base; occiput somewhat elevated, with an intricate pattern of anastomosing lines; lateral surfaces and vertex strongly roughened with tubercles, some of them bearing short, pointed bristles; ventral surface smooth, except at sides where the tubercles of the lateral surfaces are continued onto it; vertex rounded in front of eyes but scarcely overhanging insertion of antennæ, without long bristles; postocular bristles wanting. Eyes minute, consisting of nine facets, one of which is situated close to the base of the antennæ and not visible from above, the remaining eight forming a loop which curves downward to the isolated facet and within which are about six bristle-bearing tubercles. Ocelli absent, as in all members of the family. Antennæ about 1.2 times as long as head, 5-segmented (see Plate XXIX, fig. 2, for form and chætotaxy of segments); sense cones difficult to distinguish from setæ, but apparently four on segment 3 and one on segment 4.

Prothorax slightly more than half as long as head and (inclusive of coxæ) about 2.2 times as wide as median length of pronotum; pronotum broadly and shallowly impressed each side of median line; surface roughened with anastomosing lines on disk, tuberculate at sides (see Plate XXIX, fig. 1); no long prothoracic bristles. Pterothorax about 1.2 times as wide as prothorax, bearing a number of setigerous tubercles similar to those of head and pronotum; mesonotum with distinct anastomosing lines, at sides with a few small tubercles, and with a shallow circular impression each side of median line. Legs moderately stout; fore tarsi with a prominent, curved, claw-like structure on the outer surface.

Abdomen broadest at second segment and tapering evenly to base of tube; surface with anastomosing lines which are more distinct at sides of abdomen and which are prolonged posteriorly into minute setigerous asperities; posterior angles of intermediate tergites slightly produced and bearing a short, blunt bristle which is parallel to the axis of the body; ninth abdominal segment more than twice as long as eighth, surface with setigerous asperities. Tube about 0.7 as long as head and equal in length to ninth abdominal segment, form shown in Pl. XXIX, figs. 4 and 5; terminal hairs six in number, simple in structure, about four times as long as tube and half the total body length.

Measurements of holotype (♀): Length 1.19 mm.; head, length 0.187 mm.; greatest width 0.157 mm.; prothorax, length of pronotum 0.099 mm.; width (inclusive of coxæ) 0.217 mm.; pterothorax, width 0.259 mm.; interval between fore coxæ 0.119 mm., middle coxæ 0.100 mm., hind coxæ 0.123 mm.; abdomen, greatest width 0.281 mm.; segment 8, length 0.060 mm.; segment 9, length 0.136 mm.; segment 10, length 0.136 mm., width at middle 0.036 mm., at apex 0.024 mm.; terminal hairs, length 0.525 mm.

Antennal segments:	1	2	3	4	5
Length (μ)	28	41	81	28	43
Width (μ)	28	35	33	20	15

Total length of antenna 0.220 mm.

Male (apterous).—Almost identical with female in color and structure, though smaller. Tarsi armed as in female.

Measurements of allotype (♂): Length 0.90 mm.; head, length 0.146 mm., greatest width 0.121 mm.; prothorax, length of pronotum 0.088 mm., width (inclusive of coxæ) 0.168 mm.; pterothorax, width 0.174 mm.; abdomen, greatest width 0.203 mm.; segment 8, length 0.052 mm.; segment 9, length 0.096 mm.; segment 10, length 0.090 mm., width at middle 0.029 mm., at apex 0.023 mm.; terminal hairs, length 0.435 mm.

Antennal segments:	1	2	3	4	5
Length (μ)	24	36	76	24	44
Width (μ)	34	30	32	20	14

Total length of antenna 0.204 mm.

Nymph.—Color nearly white, with a slight yellowish cast and bright crimson subhypodermal pigmentation disposed in blotches along sides of head, thorax, and abdominal segments 1–8 and also along the median line from a little behind the eyes to segment 9 of abdomen, the brain and optic nerves being more or less suffused; scattered blotches of chalky-white pigmentation (subopaque by transmitted light) scattered through the body; antennæ with a narrow ring at extreme base of segment 1, distal portion beyond middle of segment 4, and to some extent the sides of segment 3, brown; extreme tip of tube likewise brown.

Head, prothorax, fore legs, antennæ, and tip of abdomen (with its usual tremendously long single pair of hairs) shown in figures 7–9 on Plate XXIX.

Described from a splendid series of 24 females, 11 males, and 7 nymphs forwarded by Professor J. R. Watson, all collected in Florida, as follows:

FLORIDA: Villa Tasso (Okaloosa Co.), May 18, 1928. R. W. Blacklock. Among leaves of oak, hickory, and magnolia collected from ground. 14 ♀'s, 9 ♂'s, 7 nymphs.

Bellview, April, 1928. E. F. Grossman. Among dry pine and oak leaves. 1 ♀.

Gainesville, Feburary, 1928. E. F. Grossman. Among dry, fallen citrus leaves. 2 ♀'s.

Illahaw, May 11, 1928. J. H. Henderson and E. F. Grossman. Among dry leaves. 2 ♀'s, 1 ♂.

Marion Co., April, 1928. E. F. Grossman. Among dead oak leaves. 1 ♀.

Mayo, February, 1928. E. F. Grossman. From dry leaves of Live Oak along barren roadside. 1 ♀.

Milligan, August 1, 1928. P. W. Calhoun. Among dead oak leaves. 1 ♀, 1 ♂.

St. Augustine, February, 1928. E. F. Grossman. Among dry leaves of Scrub Oak and Saw Palmetto. 2 ♀'s.

Type locality: Villa Tasso, Florida.

Stephanothrips Trybom.

1912. *Stephanothrips* Trybom, Arkiv f. Zool., Bd. 7, No. 33, p. 42.

1927. *Stephanothrips* Hood, Ann. Ent. Soc. Amer., Vol. XX, p. 6.

KEY TO SPECIES.

I—Vertex of head with *three* pairs of strong, anteriorly-directed bristles borne at the tips of tubercles; head distinctly nar-

rowed posteriorly; first segment of fore and hind tarsi with a strong, prominent, curved claw on outer surface. (St. Croix and Trinidad, West Indies; Florida.)
S. occidentalis Hood and Williams.

II—Vertex of head with *two* pairs of such bristles; fore and hind tarsi unarmed; head with cheeks parallel, not at all narrowed posteriorly.

a—Antennæ slender, segments 3 and 5 each about two and one-half times as long as wide; general color dark blackish brown (nearly black to the naked eye), head darkest. (California).
S. bradleyi Hood.

aa—Antennæ stouter, segments 3 and 5 each about two times as long as wide; general color grayish yellow, with head and anterior portion of prothorax brown. (Natal) .... *S. buffai* Trybom.

Stephanothrips occidentalis Hood and Williams.

1925. *Stephanothrips occidentalis* Hood and Williams, Psyche, Vol. XXXII, p. 69.
1927. *Stephanothrips occidentalis* Hood, Ann. Ent. Soc. Amer., Vol. XX, p. 6; Pl. I and Pl. II, figs. 3–5.

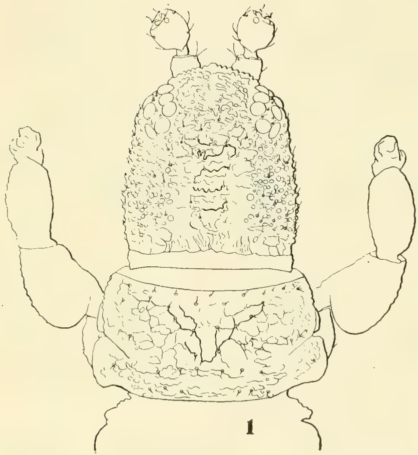
It is of interest to add to the North American list this distinct little species, described originally from St. Croix and Trinidad in the West Indies. Professor Watson has sent me three specimens, all females, taken at Miami, Florida, in May, 1928, by G. F. Weber, among "dry leaves, mostly *Populus* (?) and *Ficus,* old U. S. P. I. Garden."

PLATE XXIX.

Trachythrips watsoni gen. et sp. nov.

(J. D. H., camera lucida.)

1, head and prothorax, ♀, leg bristles omitted; 2, right antenna, ♀; 3, right maxillary palpus, ♀, ventral aspect; 4, segments 7–10 of abdomen, ♀; 5, segments 7–10 of abdomen, ♂; 6, tip of abdomen, ♂; 7, head and prothorax, nymph, probably in last instar; 8, right antenna, nymph; 9, segments 8–10 of abdomen, nymph.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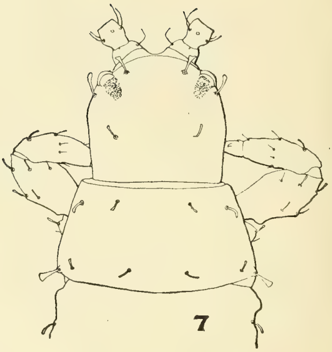
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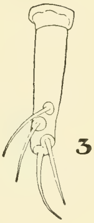
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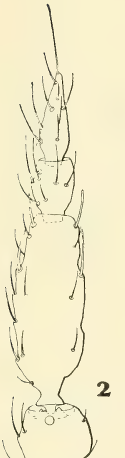
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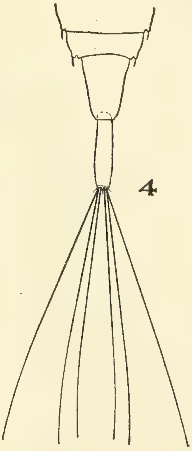
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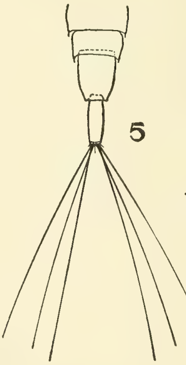
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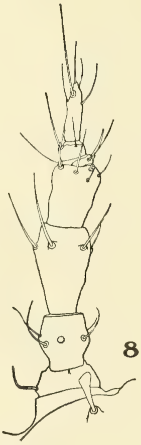
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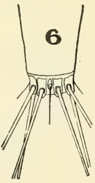
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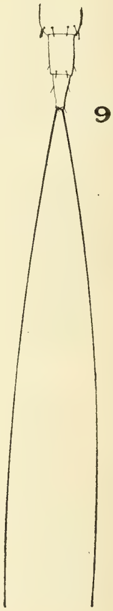
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A NOMENCLATORIAL NOTE ON THE BIRCH LEAF-MINING SAWFLY, PHYLLOTOMA NEMORATA (FALLÉN).

By Raymond L. Taylor, Assistant Forest Entomologist, Maine
Forest Service. In charge: Entomological Laboratory,
Bar Harbor.

A list of sawflies living in or on the leaves of birch (*Betula* species) compiled from the literature might be impressive. There is seen, however, an opportunity for reducing this number of species by one through the easy method of pointing out an apparent case of mistaken identity, which, perhaps, amounts to technical synonymy.

In Figure 4 of Plate 3, which faces page 226 of the book, Leaf-Mining Insects,[1] is portrayed a "Portion of a birch leaf bearing within a mine a hibernating cocoon of the sawfly, *Schizocerus mathesoni?*." The lens-like cocoon figured appeared so similar to that formed between the upper and lower epidermis of leaves of both white and gray birch (*Betula papyrifera* and *B. populifolia,* respectively) by *Phyllotoma nemorata,* an important enemy of birch in Maine, that the question of a possible synonymy arose. The speculation was further encouraged by the identity of the specific name, *mathesoni,* with the specific name by which *Phyllotoma nemorata* was known for the past twenty years, *i.e., Phlebatrophia mathesoni* MacGillivray.[2]

Correspondence with Professor Matheson in regard to this point has resulted in positive proof that the figure in the textbook cited refers to the birch leaf-mining sawfly, *Phyllotoma nemorata.* Professor Matheson kindly sent prints labelled "*Phlebatrophia mathesoni,* 1908–'09," which were made by him, and it was found, by a study of the detail, that the illustration in Leaf-Mining Insects was produced from the same negative from which the prints had been made.

It was believed at first that, at some time or other, the species may have been transferred to the genus *Schizocerus,* but it is now believed, since there are no records of such a transfer in the National Museum at Washington, and since no other species of *Schizocerus* (subfamily Schizocerinae, while the birch leaf-mining sawfly is in the Phyllotominae) is known to form a lens-shaped cocoon *within* the leaf, that the wrong genus was given. The interrogation at the end of the specific name in the caption is perhaps meant to refer to an uncertainty in regard to the genus *Schizocerus* as well as to the species.

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[1] Needham, J. G., Frost, S. W., and Tothill, B. H. 1928. The Williams and Wilkins Co., Baltimore.

[2] MacGillivray, A. D. 1909. Can. Ent., 41: 345–346.

It may not be amiss to point out, additionally, that, on page 297 of this same book, two sawflies are listed as "*Phlebatrophia mathesoni* MacG. and *P. nemorata* Fall." In view of Rohwer's recent paper,[3] in which the whole genus *Phlebatrophia,* more or less tentatively erected by MacGillivray, is transferred to *Phyllotoma* Fallén and where it is found that *Phlebatrophia mathesoni* is a synonym of *Phyllotoma nemorata,* it is obvious that the two species listed on page 297 are one and the same.

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[3] Rohwer, S. A. 1929. A note on the synonymy of a birch leaf miner. Proc. Ent. Soc. Wash., 31^3: 62–63.

NEW BUTTERFLIES AND SUNDRY NOTES.

(Lepidoptera, Rhopalocera)

By J. D. Gunder, Pasadena, Calif.

Basilarchia archippus Cram., tr. f. **nivosus** new tr. f. (Fig. 1, pl. XXX.)

The ground color is white on both surfaces instead of the usual red-brown shade. The maculation is unchanged. Classification: albinism-final; same kind of tr. f. as *Danaus menippe nivosus* Gun. and others.

Data: holotype ♂; expanse 69 mm.; Mystic, Conn., July; original collector unknown; type in author's coll.

Note: A partial check list revision of the names under this species should be made as follows:

Basilarchia Scud.
311. archippus Cram.
    disippe Godt.
    form advena Ellsw.
        cayuga Naka.
    tr. f. pesudodorippus Stkr.
        lanthanis Cook & Wats.
    tr. f. nivosus Gun.
    etc., etc.

A typical *archippus* is shown on pl. XXX. To its left are pictured gradations of tr. f. *pseudodorippus* Stkr., as lettered *a, b* and *c*. Fig. *c* illustrates the finel phase of which I know of two examples, one being in this authors coll. and the other at the Field Museum in Chicago. Strecker's type is similar to fig. *a* and also so is *lanthanis* Cook & Wats. which falls as a synonym. Fig. *aa* shows *advena* Ellsw. which should be recorded as a form, rather than a tr. f. because of its mendelian characters atavistic to the existent race *obsoleta* Edw. which it rapidly approaches. This form of the species is not uncommon.

Glaucopsyche lygdamus Dbldy., race *behri* Edw., tr. f. **sternitzkyi** new tr. f. (Fig. 2, pl. XXXI.)

Submarginal rows of black spots on the under sides of both wings tend to become obsolete. There remains a partial row on the primaries. The crescent-shaped cell spots are unaffected. Fig. *b* illustrates a typical *behri.* Classification: immaculism—the final degree would be a total lack of spots, excepting cell spots.

Data: holotype ♂, fig. *a;* expanse 30 mm.; Fairfax, Marin Co., Calif., Apr. 9, 1927. One paratype ♂, not quite so immaculate; expanse 27 mm.; Trinity Co., Calif., June 2, 1928. Types in author's coll. Named after Mr. R. F. Sternitzky, of San Francisco, the original collector.

Plebeius monticola Clem., tr. f. **montanus** new tr. f. (Fig. 3, pl. XXXI.)

Black spotting through discal areas on under sides lacking on primaries and reduced on secondaries. Cell marks unchanged. The two submarginal rows of spots at outer margins also seem unaffected. Upper sides quite typical. Fig. *b* shows an ordinary *monticola.* Classification: immaculism—with named example approaching final degree.

Data: holotype ♂, fig. *a;* expanse 22 mm.; Cajon Pass, San Bernardino Co., Calif., May 14, 1922 (Karl Coolidge); type in author's coll. (*montanus* = hilly region).

Plebeius acmon West & Hew., tr. f. **angelus** new tr. f. (Fig. 4, pl. XXXI.)

All black spots through discal areas on under sides slightly enlarged and elongated, becoming drop-shaped and pointing inward. Cell spots form dumb-bell design. The two submarginal rows of spots through limbal areas remain typical in this example. Fig. *b* shows a regular *acmon,* ♀. Classification: melanifusism—it remains to be seen whether the marginal rows also change in the final phases of this species.

Data: holotype ♀, fig. *a;* expense 24 mm.; Los Angeles, Calif., June 10, 1920. Type in author's coll.

Argynnis montivaga Behr., tr. f. **boharti** new tr. f. (Figs. 5, pl. XXXI.)

The figures show both upper and under sides of this tr. f., as well as a typical *montivaga* of the same sex and from the same locality. The maculation change is similar to *Arg. erinna cunninghami* Owen and nearby variants. The tr. f. *cunninghami* is in the Barnes coll. Conspicuous by less of usual *Argynnis* design in being almost black through limbal areas on both surfaces with discal area veining broadly black and basal areas of under side secondaries retaining evidence of silver spots and some original design. Classification: melanifusism—probably final phase because of similarity to related examples. *Mammothi* Gun. represents immaculism which is the opposite reaction in this species to melanifusism.

Data: Holotype ♀, expanse 46 mm.; Mono Pass Trail (Yosemite to Mono Lake), Calif.; July 16, 1929. In author's coll. and named after Mr. R. M. Bohart, of Berkeley, Calif., who took the specimen.

Melitaea mayi n. sp. Fig. 6, pl. XXXI.

The figures show both upper and under sides of this interesting specimen in approximately natural size. I believe that this species will be found to be as unique in comparison to other American *Melitaeas,* as is *Euphydryas gillettii* Barnes in its relation to other *Euphydryas.* In markings it is related to the *Melitaea athalia* Rott. group of Europe and Asia, coming extremely near to race *latefascia* Fixs which is found in Corea and illustrated in color by Seitz, pl. 661 of Palearctic Butterflies. The ground color is brown, the maculation black and the lighter markings of the under side secondaries, a cream-white without silvering or a definite luster. This broad band of light irregular shaped spots across the discal area of the under side secondaries is an interesting feature in making its comparison to other American *Melitaeas.* According to the Barnes & Benj. 1926 Check List this species would probably be placed at the end of the *theona-pola* group.

Data: Holotype ♂, expanse 42 mm.; small high valley four miles west of Ptarmigan Valley, Banff, Alb., Canada, July 28, 1929. A single male collected by Mr. J. F. May, of Kelwood, Man., Canada, after whom it is named.

Note: In this locality Mr. May also took *Melitaea malcolmi* Comst. which extends its range into Canada. A splendid series of *Euphy. editha beani* Skin. was also taken.

Dione vanillae L., form normal *incarnata* Riley, tr. f. **hewlettae** tr. f. Figs. 7, pl. XXXI.

The ground color is white instead of the usual red-brown shade. Silvering and black maculation unchanged. Classification: albinism—final color change.

Data: Holotype ♀, expanse 68 mm.; Ontario, Riverside Co., Calif. Taken in the summer of 1927 by Miss Esther P. Hewlett after whom it is named.

Note: The recording of this transition form completes all the names which can be given to this American race of *vanillae* under existing classification. To wit: (A) Under change of maculation comes *comstocki* representing melanifusism and its opposite *margineapertus* representing immaculism. (B) Under change of color comes *fumosus* representing chromatism and its opposite *hewlettae* representing albinism. Examples of all of these have been illustrated at the time of their original description. It is unfortunate that Mr. Riley, of London, gave a name to the American race of *vanillae* without taking into consideration previously named transition forms which goes to prove that timely abstracting of exotic literature is most necessary. I recognize error on my part in following some of our own incorrect list names.

Sundry Notes on Names and Naming.

It would be a foolish idea to try to dry up the ocean in order to stem a tide. A better plan would be to properly regulate the tide and let the ocean take care of itself. Similarly, it is better to carefully regulate the naming of insect variations, instead of curtailing, by anti-evolutionary sentiment in the Code, what might prove to be good entomological work. To achieve at least partial regulation give authors a modern system of classification under which to describe their atypical specimens and synonymy will be cut to a minimum. Eventually we will certainly do away with the old two-dimensional scheme of classification and some day with that man-made unnatural " timetable " of priority and we will adopt a general sliding scale for classification which is based entirely on the natural " timetable " of evolution. We are making a progressive step in that direction by classifying transition forms and allowing them the recognition they deserve. Their grade on the evolutionary stage is no longer a matter of guess work. The fact of scarcity is never an excuse in scientific investigation, though it may be a problem.

Classification of variation requires study, as well as a constant review of new literature. But there will always be present authors who follow the paths of least resistance. An easy way to dodge responsibility and shift uncertain classification to others is to use the word " variety." The phrase " new variety " in original description is a convenient entomological cover-all, having a different positional status in the opinion of every one in America, as well as in Europe. It won't hurt taxonomy to stop using that word, for there are other more logical terms to use in its stead. " Sub-species " is another word which is going into disuse, because "race" is more expressive. Besides "sub-species" is sometimes used to mean any one thing under species. It has been used many times to definitely suggest much lower steps on the classification scale, than " race " would indicate. For this reason its use as a positive fixation is not advised. I do not advocate the use of the words "aberration " or " ab " for reasons as first given on p. 265, vol. 38, November, 1927, *Entomological News.*

The use of a term in original description which infers variation due to malformative or uninheritable causes suggests specimens unfit for classification on a natural development scale; therefore, to designate legitimately recurrent variation of specific nature, I have employed for several years, the expression " transition form," or its abbreviation—" tr. f." If authors will gradually come to use this term and acquaint themselves with the systematic arrangement under which their transition forms always occur, they will save themselves considerable synonymical chagrin through duplication. The day is passing (in America at least) when an author can slap on a " new ab." without thought or direct reference to similar nearby names and get away with it.

Some notes on recently described butterflies follow:

Minor Chermock for *Eury. philodice* Godt., form ♀ *plicaduta* Naka. (Bul. Brook. Ent. Soc., p. 118, vol. XXII, April, 1927.) Type a dwarf. See " Unnamable Butterflies," July, 1928, *Ent. News.* Falls as a synonym under species *philodice.*

Alba Chermock for *Eury. philodice* Godt., form ♀ *plicaduta* Naka. (Bul. Brook. Ent. Soc., p. 119, vol. XXII, April, 1927.) Nakahara's name takes care of both yellow and white females which have or tend to have solid black borders. Falls as a synonym under *plicaduta,* as does *"albida"* which was "A Correction," as stated on p. 173, Oct., 1928, issue.

Ehrmani Chermock for *Eury. philodice* Godt., form ♀ *plicaduta* Naka. (Bul. Brook., p. 118, vol. XXII, April, 1927.) Reduction or enlargement of the discoidal spot or variance of marginal width, without suffusion, represents the naturally reciprocal tendency within the limits of the described species. (An Eskimo with big broad shoulders is an Eskimo just the same.) Falls as a synonym under *plicaduta.*

Boweri Chermock for *Saty. eurydice* Joh. (Bul. Brook. Ent. Soc., p. 119, vol. XXII, April, 1927.) Number of individual spots, gradation or lack of spots have never been recognized as namable characteristics for the *Satyridae* groups which are continually and individually variable in this regard. Falls as synonym to the species.

Intermedia Chermock for *Glau. xerces* Bdv. (Bul. Brook. Ent. Soc., p. 20, vol. XXIV, Feb., 1929.) An examination of the illustrations of the allied *xerces* figures pictured in Comstock's "Butterflies of California" will show that there are more than enough names applied near this species. Falls as a synonym possibly under *antiacis* Bdv. There is no transition sequence between black to grey in these names.

Borealis Chermock for *Cercy. pegala* Fabr. (Bul. Brook. Ent. Soc., p. 21, vol. XXIV, Feb., 1929.) Only an extreme *alope nephele* Kirby under which it falls as a synonym. Ohio has been too well combed over to produce a constant new race.

Laurae Chermock for *Eury. eurytheme* Bdv., form *eryphyle* Edw. (Bul. Brook. Ent. Soc., p. 21, vol. XXIV, Feb., 1929.) Tr. f. *alba* Stkr. takes care of albinism for the species *eurytheme,* as well as its seasonal forms.

Serrata Chermock for *Eury. philodice* Godt. (Bul. Brook. Ent. Soc., p. 21, vol. XXIV, Feb., 1929.) Variation of the contour of the inner margin of the marginal band of all species within the *Eurymus* is variation within the converging limits of the species itself and not classifiable under suffusion. A synonym of *philodice.*

Fulvus Rummel for *Lyc. hypophlaeus* Bdv.; also

Neui Rummel for *Lyc. hypophlaeus* Bdv. (both Bul. Brook. Ent. Soc., p. 268, vol. XXIII, Dec., 1928). *Fulvus* represents melanifusism, likewise does *banksi* Wats. & Comst., both of which are synonyms under *fasciata* Stkr. *Neui* is a chrysalis burn or malform and synonymous under the species. *Octomaculata* Dean is a form, a mendelian form, atavistic probably to existent western representatives in the genera. Only three transitions forms for the species are possible, all have been named. The following check list revision is suggested:

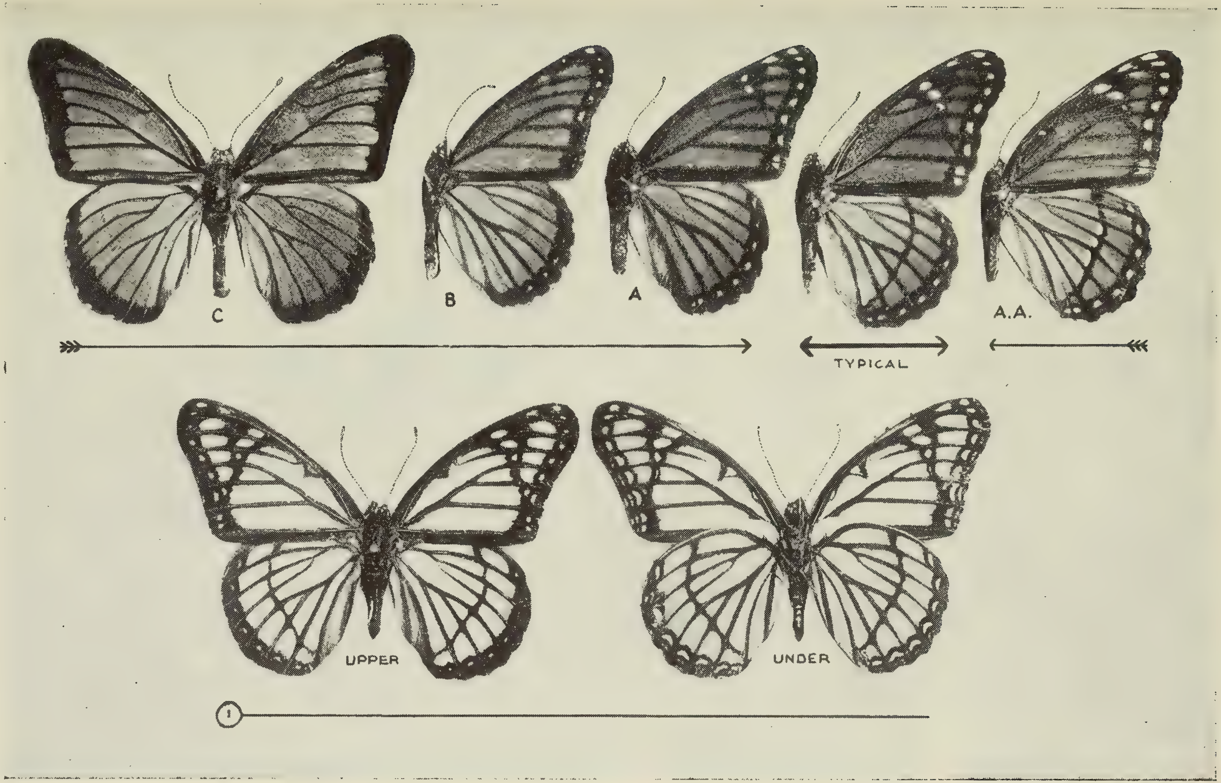
Lycaena Fabr.
415. hypophlaeas Bdv.
    americana Harr.
    neui Rumm.
    form octomaculata Dean
    tr. f. fulliolus Elst. (*chromatism*)
    tr. f. obliterata Scud. (*immaculism*)
        caeca Reiff
        obsoleta B. & McD.
    tr. f. fasciata Stkr. (*melanifusism*)
        banksi Wats. & Comst.
        fulvus Rumm.

Streckeri Holland for *Pap. bairdii* Edw. (Bul. Carn. Mus., p 310, no. 2, vol. 17, April, 1927.) *Asterioides* Reak. should be placed as a synonym under *bairdii*. In my series of *bairdii* from Arizona in particular, New Mexico, the Great Basin and Southern California, most of the males have, on their upper side, the fully developed yellow mesial band of spots (as on Edwards's singly described male type); while in others there is a gradual loss of this band, until in some specimens, it is totally absent. Likewise in the females, this same gradation occurs, some having this same band of spots (an interesting notation!), while the majority, of course, are always without it. The yellow crescent cell spots, in both sexes, appear or increase in size according to the increase of yellow design elsewhere. Another point of interest is that some examples have a visage of the reddish tinge within the yellow on the under side secondaries and some have not. The conclusion is that by this variability, our western *bairdii* shows its mendelian inheritance, either to or from, the eastern cousin *Pap. ajax* L. (*asterias*). The named illustration of *streckeri* Holland is referable to none of the eight divisions under which tr. fs. are classified and the name will fall, as a slight straight synonym, probably under syn. *asterioides* Reak.

Nebraskensis Holland for *Brenthis myrina* Cram. (Ann. Carn. Mus., p. 36, no. 1, vol. XIX, Dec., 1928). I believe it is conceded that dwarfs and giants find no place in present day classification through the application of specific names. Size alone counts for nothing in a species having a considerable range where environment produces largeness or smallness only. Imperial Valley in California develops the largest common *Cynthia cardui* L. of any place in U. S., but they don't seem to be worthy. *Nebraskensis* which was given under the vague term " variety " to four males falls as a synonym under *myrina*.

Pardopsis Holland for *Brenthis bellona* Fabr. (Ann. Carn. Mus., p. 36, no. 1, vol. XIX, Dec., 1928). This is a name where illustration would be of great help, but I trust it represents a showing towards immaculism, that is a first degree tendency at least towards lack of design. Tr. f. *kleenei* Wats. which is a well developed phase of melanifusism unfortunately falls as a synonym to tr. f. *fasciata* Ckll. which in a much lesser degree represents the same thing. Cockerell's poor description as well as Maynard's illustration on which he based his name are both terrible pieces of entomological reference.

Biedermanni Ehrman for *Eurema mexicana* Bdv. (Bul. Brook. Ent. Soc., p. 84, vol. XX, April, 1925). A male specimen from Arizona with slightly heavier black emargination on upper side secondaries as well as on primaries. This excess encroachment of the black partly cuts the contour of the "jaw of the dog-head" design and Mr. Ehrman's idea of classification placed it as a new species. Marginal width variation within either the genera *Eurymus* or *Eurema* are strains not generally classifiable under transition forms unless the suffusion or immaculation is apt to be entirely complete over the wing and for certain well known species, like *mexicana* for example, this is doubtful; therefore, the name *biedermanni* only represents variation within the legitimate alternate limits of the species and falls as a synonym thereof. *Recta* Klots (Ent. Am., p. 134, vol. IX, Dec., 1928) is a name applied to oppositely marked specimens from *biedermanni* or those having less heavy black emargination. Most of the foregoing synonymical reference is applicable to this name. See note on the above synonymy of *serrata* Chermock for additional reference.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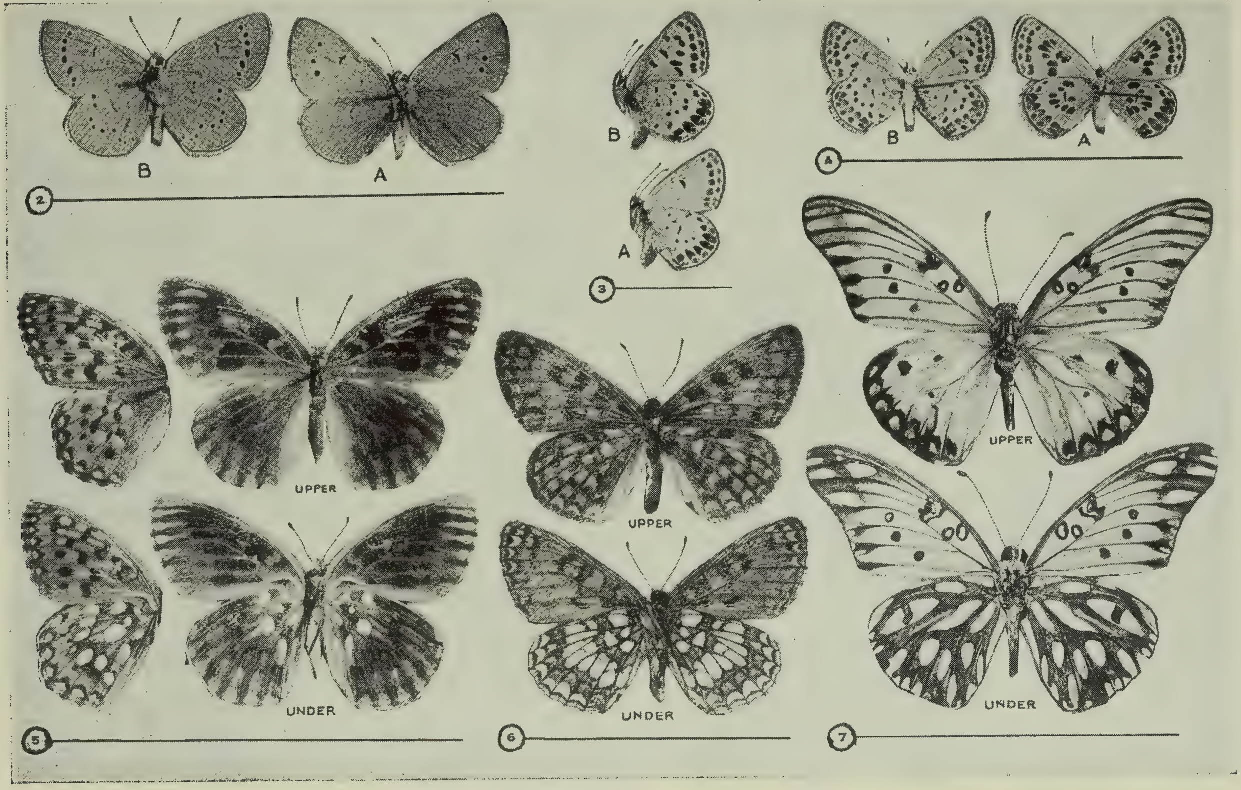
New Butterflies and Sundry Notes—Gunder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New Butterflies and Sundry Notes—Gunder

THE GENUS EURYGENIUS LA FERTE (COLEOPTERA) IN OUR FAUNA.

By H. C. Fall, Tyngsboro, Mass.

Since 1851, when Le Conte described his *Eurygenius constrictus* from California, this genus has been accredited to our fauna. In 1895 (Coleop. Notices, VI) Casey gave reasons for doubting the correctness of this generic reference and erected the genus *Retocomus* for our so-called *Eurygenius* species.

Notwithstanding the rejection of *Retocomus* in the Leng List and the continuance of our species under *Eurygenius,* I am quite convinced after a careful study of La Ferté's generic descriptions and figures that if the characters on which his *Eurygenius* and *Stereopalpus* are based are accepted as of generic rank, then the course pursued by Casey is the only logical one.

In this connection it is of interest to say that the two species described below, by the large eyes which are not at all emarginate in front (hence not *Retocomus*), the short oblique tempora and the shorter and more triangular terminal joint of the maxillary palpus as compared with the long cultriform last joint in *Stereopalpus,* seem to be definitely assignable to *Eurygenius.*

Eurygenius parvicornis n. sp.

Slender, convex; elytra, body beneath, legs and antennae pale brown, thorax a little darker, head piceous; vestiture ashy white, recumbent, moderately plentiful but not concealing the color of the derm.

Eyes large and prominent, not at all emarginate, margin back of the antennae barely perceptibly flattened, separated on the front by about their own width; tempora short, oblique.

Antennae short, slender, reaching only to the base of the thorax, joints proportioned as in *Stereopalpus.*

Prothorax not quite as wide as the head, just perceptibly longer than wide, widest at apical fourth, rounded in front, sides moderately convergent and not sinuate to the rear; sculpture consisting of lunate ridges or incompletely walled punctures, median line not impressed.

Elytra elongate, nearly parallel sided, ½ wider than the thorax and about 2½ times as long as wide; rather closely moderately coarsely punctate.

Body beneath more finely punctured and more thinly pubescent than above. In the female the fifth ventral is subequal in length to the fourth, the apical margin rounded; in the male the fifth ventral is much longer than the fourth, flattened or a little concave medially at apex, the concavity limited by ridges which are produced posteriorly to form acute cusps, between which the apex is roundly emarginate. Length 5.5 to 6 mm.; width 1.75 to 1.85 mm.

Described from 2 ♂ and 1 ♀ from the Davis Mts., Texas. The type (♂) bears label "Davis Mts., Texas, Fort Davis Quad, Phantom Lake, v–25–1916, F. M. Gaige."

Eurygenius perforatus n. sp.

Very similar in all essential features to the preceding species. The eyes, tempora and antennae are nearly the same, as is the modification of the ventral apex in the male. The color, however, is more uniformly pale yellowish brown, the head not darker; the pubescence is less appressed and the elytra are notably more coarsely deeply and closely punctate, the punctures not concealed by the pubescence. The size is a little smaller, the length varying between 3.75 and 4.75 mm. (head deflexed).

California (Palm Springs, 8–30–23), 4 ♂, 1 ♀, collected and submitted by Mr. A. C. Davis, of Garden Grove, Calif.

The type is a male in my own collection; paratypes in Mr. Davis's collection.

BOOK NOTES

Flowers and Insects, by Charles Robertson (pp. 1–221). (Published by the author, Carlinville, Ill., 1929.)

This is a voluminous record and certainly most useful in a reference library. However, it is not easy reading, for it consists, except for the Preface, of extensive lists of technical names of plants and insects, arranged in the botanical order of the plants, according to Gray, 1908. What is given in this work are the records of many years' observations reduced to a book and compressed within the limits of 220 pages.

As is to be expected, the greatest number of records is of Hymenoptera, of which 664 species are named; the next is of Diptera, recording 446 species. Equally naturally, the least number (except for the one Neuropteran) is 25 Heteroptera. The Coleoptera number 153 species, and the Lepidoptera 99. The four major orders are not only numerous in species but they also contain many nectar and pollen feeders.

Naturally, I cannot profitably discuss any group except the Heteroptera. The single Neuropteran is absolutely negligible in every respect, being merely an adventitious visitor. The Heteroptera are practically in the same case. *Orius* (here called *Triphleps*) *insidiosus, Nabis* (here called *Coriscus*) *ferus, Sinea diadema, Phymata wolfii* and *Podisus serieventris* (here called by the old name *spinosus*), are all known predators and frequent flowers to hunt in them. *Orius* is common on daisy (*Chrysanthemum leucanthemum*); *Phymata* is general in panicles or umbels, such as the various golden rods (*Solidago*) and Queen Anne's Lace (*Daucus carota*), where it lies concealed to trap the Diptera and Hymenoptera; and *Sinea* is another hidden hunter, found where its chosen prey abounds, principally on red clover (*Trifolium pratense*), for example. None of the others is a habitual flower feeder. Indeed, the records of the numbers of each found on flowers, generally single individuals, clearly shows this. But in any event, all are plant feeders; and the records are doubtless new food plants for some of them.

The plants on which this residual 21 species were found follow:

Plagiognathus obscurus Uhler—*Oxypolis rigidior, Pastinaca sativa, Zizia aurea.*

Lopidea media Say—*Cacalia reniformis, Liparis liliifolia, Clematis virginiana, Aruncus sylvester, Sanicula marilandica, Sium cicutaefolium, Thaspium aureum trifoliatum.*

Lygus pratensis L.—*Apocynum cannabinum, Asclepias syriaca, Aster erisoides villosus, Boltonia asteroides, Erigeron philadelphicus, E. ramosus, Helianthus annuus, H. laetiflorus, H. tuberosus, Parthenium integrifolium, Rudbeckia hirta, Solidago nemoralis, S. ulmifolia, Cassia chamaecrista, Strophostyles helvola, Erythronium albidum, Isopyrum biternatum, Ceanothus americanus, Salix cordata, Staphylea trifolia, Eulophus americanus, Osmorrhiza longistylis, Oxypolis rigidior, Pastinaca sativa, Zizia aurea.*

Calocoris rapidus Say (recte, *Adelphocoris*)—*Asclepias sullivanti, Erigeron philadelphicus, Helianthus laetiflorus, H. scaberrimus, Parthenium integrifolium, Solidago canadensis, Pycnanthemum flexuosum, Petalostemum purpureum, Ceanothus americanus, Verbena hastata.*

Phytocoris schupeus Say—*Heracleum lanatum, Pastinaca sativa.*

Oncopeltus fasciatus Dallas—*Asclepias incarnata, A. purpurea, A. syriaca, Pycnanthemum flexuosum, Cephalanthus occidentalis, Eryngium yuccifolium, Oxypolis rigidior.*

Lygaeus turcicus Fabr. (*kalmii* Stål?)—*Apocynum cannabinum, Asclepias incarnata, A. syriaca, Stellaria media, Aster anomalus, A. ericoides villosus, Cacalia tuberosa, Cirsium pumilum, Heliopsis helianthoides, Eryngium yuccifolium, Eulophus americanus, Cium cicutaefolium, Thaspium aureum trifoliatum, Krigia amplexicaulis, Solidago canadensis, S. missouriensis, S. nemoralis, Nepeta cataria, Pycnanthemum flexuosum, P. virginianum, Melilotus alba, Polygonum lapathifolium, Ceanothus americanus, Salix humilis, Veronica virginica.*

Melanocoryphus bicrucis Stål—*Cacalia reniformis.*

Ortholomus longiceps Stål (recte, *scolopax* Say)—*Pycnanthemum flexuosum.*

Chariesterus antennator Fabricius—*Euphorbia corollata.*

Alydus eurinus Say—*Aster multiflorus, A. paniculatus, Eryngium yuccifolium.*

Alydus pilosulus Herrich-Schaeffer—*Aster multiflorus, Solidago canadensis, S. nemoralis.*

Harmostes reflexulus Say—*Aster ericoides villosus.*

Corizus lateralis Say—*Erigeron philadelphicus, Pastinaca sativa, Polytaenia nuttalli.*

Euschistus fissilis Uhler (recte, *euschistoides* Vollenhoven)—*Helenium autumnale.*

Euschistus variolarius Palisot de Beauvois—*Asclepias syriaca, Bidens aristosa, Eupatorium serotinum, Helenium autumnale, Salix humilis.*

Euschistus ictericus Linnaeus—*Pycnanthemum flexuosum, Petalostemum purpureum, Polytaenia nuttalli, Zizia aurea.*

Corimelaena lateralis Fabricus—*Cryptotaenia canadensis, Taenidia integerrima, Chaerophyllum procumbens.*

Corimelaena pulicaria Germar—*Parthenium integrifolium, Sassafras laurifolium, Geum canadense, Cicuta maculata, Chaerophyllum procumbens, Heracleum lanatum, Pastinaca sativa, Sanicula marilandica, Sium cicutaefolium.*

Canthophorus cinctus Amyot & Serville (recte, *Sehirus*)—*Ceanothus americanus.*

It may be seen by perusing the preceding list how slight is its ecological significance. Obviously, as pollinators, these few Heteroptera observed on flowers are of negligible importance. As to food plants, here too, we find data which possibly extend the known range of food plants, but are no indication of the native or preferred food-plant. For example, take *Lygus pratensis.* It may or may not be this species, according to our later understanding. But assuming that it is, this bug is omnivorous, abundant and widespread; it may be found anywhere, and its occasional appearance on a flower means nothing. The same may be said of the *Euschisti,* which are strong fliers. *Calocoris* (now *Adelphocoris*) is in the same situation.

A curious fact presents itself in this analysis. The preferred food of *Corizus* is the Polygonums, yet none was found on their flowers. *Ortholomus* is most abundant on *Spiraea,* and I have myself seen it on the blossoms, but Mr. Robertson does not record is as so found. The mirid *Lygus pabulinus* is abundant on its foodplant *Impatiens biflora,* but it is not recorded from its blossoms, although I have taken it at flowering time. *Ceanothus* harbors during its flowering season enormous numbers of *Gargaphia angulata,* yet it would seem they shun its blooms. Daisy heads are the hunting ground of *Orius* preying on the *Thrips* that there abound, but none seems to have been observed on them. *Capsella bursapastoris* is the foodplant of *Peribalus limbolarius,* but it was not found on the flowers. *Anasa repetita* is found only on *Sicyos angulatus,* but seems to shun its flowers. In fact, one could go through the entire list and record similar absences of bugs from the flowers of their known foodplants.

EDITORIAL.

ON AUTHOR'S CORRECTIONS.

(Or Additions, or Improvements.)

Our editorial policy toward our valued contributors is, and, we hope, will always be, liberal. But there are one or two places in which we must be careful, much as we would prefer to be prodigal. One of these is that which is kindly called "author's corrections." Of all costly details in printing, these are among the most expensive. Authors, of course, are not always editors, wherefore they do not always realize what it means to add more words to an article already in type; or to take them out in number. So little a thing as the substitution of an eight-letter word for a three-letter word in the middle of a page may cause the resetting of a half-page—*always* charged for in the printer's bill.

The acute financial stringency in all our biological publications forces all of us editors to pinch the pennies. And if, unfortunately, additional pence appear on the bill, we are compelled to extract them from the author responsible.

Our assumption at all times is that a paper submitted for publication is complete and perfect. And we accept it on that basis only. If later it turns out that the author omitted something he should have said, or made some statement not quite acceptable to him when he sees it in cold type, we must pass the charge for such an emendation to him. We do it regretfully, but we must keep down our costs.

We have mentioned this on other occasions, but it appears to be a tonic that must be administered again off and on to have it strong in the consciousness of our much appreciated authors.

So, please remember, dear authors, that we charge back to you the cost of all material changes you make in your article, *after* it is in type.—J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF MAY 16, 1929.

A regular meeting of the Brooklyn Entomological Society was held in the Brooklyn Museum on Thursday evening, May 16, 1929, at 8.10 p. m.

President Davis in the Chair and twelve members present, *viz.:* Messrs. Ahlund, Bell, Bigelow, Chapin, Eisenhardt, Engelhardt, Lemmer, Schaeffer, Sheridan, Siepmann, and Torre-Bueno; and Dr. Risch.

Minutes of the previous meeting read and approved.

Mr. Torre-Bueno reported briefly for the Publication Committee.

Mr. Engelhardt presented the report of the Treasurer.

Mr. Eisenhardt proposed the two following gentlemen for membership:

Dr. Otto E. F. Risch, 785 Carroll Street, Brooklyn, N. Y.

Mr. Charles Ahlund, 516 Eleventh Street, Brooklyn, N. Y.

Both Dr. Risch and Mr. Ahlund being present, it was regularly moved and seconded that the By-Laws be suspended and that the Secretary cast one ballot for the election of both, which was accordingly done, and Dr. Risch and Mr. Ahlund were elected to membership.

The Secretary read letters from Mrs. Anna B. Comstock, wife of Dr. Comstock, Dr. Walther Horn and Dr. Karl Jordan expressing their appreciation of the Society's action in electing them Honorary Members of the Society.

Mr. Torre-Bueno remarked on some specimens of *Hemiptera* brought by Mr. Siepmann. He also showed the following books and commented on them: The Principles of Systematic Entomology, by Gordon Floyd Ferris, and Instinct and Intelligence, by Major R. W. G. Hingston, M.C., published in the Book League Monthly (also as a separate work by the Macmillan Co.).

Mr. Schaeffer showed specimens of the beetles *Oberea basalis* Lec. raised on black-topped aster, and *Tachymerus gleditsiae* Linnaeus bred from the seeds of Palmetto, from Brownsville, Texas, both of which were collected by Mr. Engelhardt.

Mr. Davis showed a postal-card received from Mr. Notman, from Covington, Louisiana, and remarked on Mr. Notman's long collecting trips across the continent. He also showed a specimen of the Geometrid moth, *Epelis truncataria* Walker, collected at

Lakehurst, on bearberry and one collected by Mr. Roy Latham at Manorville, Long Island, July 4, 1925. He also showed specimens of the Saturnid moth, *Callosamia promethea* Drury, two males and two females, which were bred from cocoons that had carried over one year, the normal emergence should have been in the spring of 1928 but they did not emerge until the spring of 1929.

Mr. Bigelow exhibited a specimen of the beetle *Dibolocelus ovalis* Ziegl., collected by Mr. W. T. Davis on Staten Island, representing the second Staten Island record of the species and taken twenty years after the first record; he remarked on the differences between this beetle and *Hydrous triangularis* Say, the common-so-called "electric light beetle" which it resembles. He also showed a specimen of the Buprestid beetle *Buprestis striata* Fabricius.

Mr. Torre-Bueno gave an account of his experiences in Mexico in 1910 when he was there on a business trip, but found time to do some collecting also; he exhibited specimens of a large number of species of *Hemiptera* which he collected there and remarked on their distribution and habits.

Mr. Engelhardt exhibited several boxes of insects collected during his trip to Florida during March of this year and remarked on his experiences in getting them.

Adjourned at 10.10 p. m.

MEETING OF OCTOBER 10, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, October 10, 1929, at 8.15 p. m.

President Davis in the chair, and ten members present, viz., Messrs. Chapin, Eisenhardt, Engelhardt, Hunter, Lemmer, Schaeffer, Sheridan, Shoemacher, Siepmann, and Torre-Bueno; and four visitors.

In the absence of the Secretary, Mr. Siepmann acted as secretary pro tem.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the monthly report of the treasurer, and Mr. Torre-Bueno reported for the publication committee.

Mr. Schaeffer proposed for membership Mr. Kenneth W. Cooper, 40–40 So. 167 St. Flushing, N. Y. As Mr. Cooper was present, it was regularly moved and seconded that the by-laws be suspended, and the secretary cast one ballot for the election of Mr. Cooper, which was accordingly done.

Mr. Engelhardt brought to the attention of the Society the deaths of Dr. F. H. Chittenden, a life member of the society; of Mr. Charles J. Martin, an honorary member, who died on July 29, 1927, at the age of 92, and of Mr. Tom Spaulding, of Provo, Utah, a well-known collector.

Mr. Chapin gave some interesting observations on the parasitic worms infesting domesticated animals.

Mr. Sheridan spoke of his collecting along the Navesink River during the past summer.

Mr. Shoemacher related his collecting experiences at Greenwood Lake and in the Pocono Mountains, being chiefly interested in Buprestidæ. He also exhibited a specimen of *Physonota unipunctata* vr. *quinquenotata,* a large cassidinid beetle, taken in Van Cortlandt Park.

Mr. Burke reported that he obtained *Libellula vibrans* in moderate members on Staten Island and in Van Cortlandt Park. This species is generally scarce, the past summer being one of the years it was common.

Mr. Lemmer spoke of the Lepidoptera he collected at Lakehurst, N. J.

Mr. Eisenhardt told of his collecting experiences in the Berkshires. He observed large numbers of *Colias philodice* in the meadows, a male of the variety alba being also taken.

Mr. Cooper spoke of collecting *Anophthalmus,* a kind of blind carabid beetle, in the Virginia caverns.

Mr. Torre-Bueno told of his observations of a large wasp, *Sphecius speciosus,* which fills its burrows with Cicadas. He also reported finding *Anthocoris borealis* common in the curled-up leaves of beech: a species which most collectors find pretty scarce.

Mr. Engelhardt exhibited two male specimens of a rare hawk moth, *Sphinx elsa* Neumoegen, collected in Estancia Valley, New Mexico, in June, 1929. He said that the species was at one time almost lost to collectors, but believes that it will again be taken in moderate numbers.

Mr. William T. Davis stated that one of the ways of noting the interesting differences in the passing years was by observing the conspicious butterflies that may appear each summer. After several years of scarcity, the Monarch butterfly, which was very common in 1922, is again gradually approaching a period of maximum numbers which will no doubt be attained several years hence. *Basilarchia astyanax* was very common in Staten Island in the summer of 1923, and has since been gradually decreasing in numbers. Not a single specimen was noted on the Island during the summer of 1929. *Apatura clyton* formerly not common, has lately been found in numbers about the *Celtis* trees at Richmond, while *Eurymus eurytheme* has become generally distributed on the Island since 1927. It was a common species last summer. *Megistias fusca* Grote & Robinson, was collected in some numbers at Tottenville in June, 1897. On August 26, 1929, a single example was taken in the filled-in area at the docks, Tompkinsville.

Mr. Siepmann spoke of his collecting trip to the Unaka National Forest, Tennessee.

Adjourned at 10.15 p. m.

Carl Geo. Siepmann,
Secretary, pro tem.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

WE WISH to procure in exchange or on cash: *Parnassius of North-America,* with its varieties and aberrations, well labelled, spread or in papers (clodius, smitheus, eversmanni). Dr. Staudinger & A. Bang-Haas, Dresden-Blasewitz.

THE MUSEUM of the Brooklyn Institute has a few uncolored sets of the Calverly, Weidenmeyer and Edwards plates of North American Sphingidae for exchange or for sale at $5 per set. Address, Librarian, Brooklyn Museum, Eastern Parkway, Brooklyn, N. Y.

LEPIDOPTERA from the Mountains of Kentucky. Papilios and other var. of this section collected. Paper spec. of *Xylophanes tersa* and *Catopsilia eubule* on hand. Also Cocoons of the larger Saturnid moths. Ellis Chandlee, Barbourville, Ky.

BUTTERFLY COLLECTORS—Have you butterflies which look different in color or pattern from the average? (See advertisement). Please write. Jeane Gunder, Pasadena, Calif.

CHRYSOMELIDAE, CRYPTOCEPHALINI. Wish beetles of this group from all over world. Will exchange local Coleoptera or purchase for cash. Write me before shipping material. Paul N. Musgrave, 514 Mt. Vernon Ave., Fairmont, W. Va.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

The American Entomological Company of Brooklyn, N. Y., has come to Life again in the shape of CARPOCAPSA, Pittsburgh, Pa.

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Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

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BULLETIN

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NEW SPECIES OF PSEUDOPSALLUS VAN D. WITH AN ALLIED NEW GENUS DESCRIBED (HEMIPTERA, MIRIDAE).[1]

By Harry H. Knight, Ames, Iowa.

Bifidungulus new genus.

General aspect much as in *Pseudopsallus* Van D. but the deeply cleft claws require generic separation. Arolia moderately slender and converging apically as in *Orthotylus;* claws sharply bent, deeply cleft much as in *Deraeocoris ruber* L., but basal part or tooth more prominent, the slender apical half of claw extending only one-fourth of its length beyond the top of basal tooth. Genital structures indicate a relationship with *Pseudopsallus*; postero-dorsal margin of the genital segment with chitinous hooks or prongs which appear to be accessory copulatory claspers; genital claspers highly developed and providing specific characters. Pubescence of two types; rather thickly clothed with fine, erect, simple hairs and sparsely intermixed with silvery sericeous pubescence. Refers to the subfamily Orthotylinae. Genotype: *Bifidungulus viridicans* n. sp.

Bifidungulus viridicans n. sp.

Suggestive of a small green *Pseudopsallus* but readily distinguished by the structure of the claws; genital structures distinctive.

♂. Length 3.7 mm., width 2.8 mm. Head: width .75 mm., vertex .39 mm.; vertex with slight ridge across base but not carinate, frons moderately convex, tylus visible from above and arcuate as viewed from the side, facial angle nearly a right angle. Rostrum, length 1.25 mm., reaching to middle

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[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames.

of hind coxae. Antennae: segment I, length .23 mm., thickness .086 mm.; II, .87 mm., equal in thickness to segment I but more slender at base, thickly clothed with fine yellowish pubescence; III, .60 mm., more slender; IV, .34 mm.; greenish yellow, last two segments dusky. Pronotum: length .65 mm., width at base 1.21 mm., basal margin broadly arcuate, sides nearly straight, disk moderately convex, calli only slightly swollen. Scutellum nearly triangular, slightly convex, mesoscutum moderately exposed.

General coloration green to yellowish, hemelytra semitranslucent, legs and ventral surface more yellowish; tibial spines pale yellowish, without spots at base, claws and tips of tarsi black. Membrane pale to dusky, veins green or yellowish. Clothed with prominent, erect, pale pubescence, intermixed with more sparsely placed, silvery sericeous pubescence. Genital structures distinctive; postero-dorsal margin of genital segment with three spine-like processes, two of these broadly joined at base, somewhat U-shaped but with tips incurved; the third process arises at the right side of the mesal line and points distad.

♀. Length 3.9 mm., width 1.4 mm. Head: width .78 mm., vertex .43 mm. Antennae: segment I, length .22 mm., thickness .10 mm.; II, .86 mm., more slender than segment I; III, .56 mm.; IV, .34 mm.; yellowish, last two segments dusky.

Holotype: ♂ August 4, 1925, Wray, Colorado (H. H. Knight). *Allotype:* same data as the type. *Paratypes:* 2 ♀, taken with the types. ARIZONA—3 ♂ 1 ♀, "Ariz." (Gillette). KANSAS—2 ♂ June 27 (Marlatt); 16 ♂♀ Sept. Riley County (Popenoe). ♂, Hamilton County (F. H. Snow). TEXAS—18 ♂♀ June 9, 4 ♂ 1 ♀ Aug. 9, 1926, Port Lavaca (E. P. Ewing), taken on *Gauva parvifolia.*

Bifidungulus puberus (Uhler).

After examining a male cotype of *Oncotylus puberus* Uhler I find that it is congeneric with *Bifidungulus viridicans* n. sp. *Puberus* Uhler has the same type of claws and arolia as *viridicans,* but size larger and the genital structures different although of the same generic type. I have a male specimen taken April 19, 1924, Tucson, Arizona (A. A. Nichol).

Pseudopsallus artemisicola n. sp.

Color aspect and size of *sericatus* Uhler, but differs in structure of male genitalia, also more finely and sparsely pubescent, the dorsum clothed with white hairs only.

♂. Length 6.3 mm., width 2 mm. Head: width .96 mm., vertex .47 mm. Rostrum, length 1.52 mm., barely attaining hind margins of middle coxae, green to yellowish, apex black. Antennae: segment I, length .38 mm., green to yellowish; II, 1.73 mm., cylindrical, only slightly more slender than segment I, yellowish to brownish, sometimes becoming fuscous, thickly clothed with short brownish pubescence; III, .82 mm., more slender, fuscous; IV, .43 mm., fuscous. Pronotum: length .95 mm., width at base 1.73 mm.

General coloration pale bluish green, scutellum paler, mesoscutum yellowish, suture blackish. Legs yellowish green, femora with setigerous black points on distal half from which black bristles arise; tibial spines black, without black points at base except three or four basal spines; tarsi yellowish brown, distal segment and claws black. Membrane pale, veins green, cubitus bordered by a yellow calloused line. Clothed with prominent, erect, moderately abundant white hairs, intermixed with more thickly spread, recumbent, silver white sericeous pubescence. Genital structures distinctive, postero-dorsal margin of genital segment armed with three ventrally projecting, blade-like chitinous spines, much longer and more prominent than in *sericatus,* the middle blade widest and sinuate in form; left clasper with a dorsally projecting lobe, its sides nearly parallel, apex rather broadly rounded, summit armed with two short, inturned brown chitinous spines; right clasper distinctive also but not so easily described.

♀. Length 5.8 mm., width 2.12 mm. Head: width 1.01 mm., vertex .56 mm. Antennae: segment I, length .39 mm.; II, 1.73 mm., more slender than in the male, greenish yellow; III, 1.43 mm., yellowish to fuscous; IV, .46 mm. More robust than the male but very similar in pubescence and coloration. All specimens macropterous, with no indication of the brachypterous condition found in *sericatus* Uhler.

Holotype: ♂ August 25, 1925, Hudson, Colorado (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 56 ♂ ♀, taken with the types on sage brush (*Artemisia filifolia*) where the species was breeding. Perhaps two hours were consumed in sweeping sage brush to obtain the above specimens, whereas at the same time several hundred specimens of *Paracalocoris deleticus* Reut. were taken in the net.

Labopidea sericata Uhler must be referred to the genus *Pseudopsallus* Van D., if the type of genital structures are given due consideration. The type of pubescence and the antennae also confirm this relationship. The blade-like chitinous projections on the postero-dorsal margin of the male genital segment appear to form one good character at least which all members of this genus possess.

Pseudopsallus anograe n. sp.

Allied to *artemisicola* but smaller, deeper bluish green in color; genital structures distinctive.

♂. Length 5.2 mm., width 1.8 mm. Head: width .88 mm., vertex .45 mm. Rostrum, length 1.23 mm., reaching to middle of intermediate coxae, greenish, apex black. Antennae: segment I, length .30 mm., bluish green; II, 1.12 mm., cylindrical, thickness nearly equal to segment I, more slender at base, greenish to dusky; III, .93 mm., fuscous; IV, .39 mm., fuscous. Pronotum: length .74 mm., width at base 1.47 mm.

General coloration deep bluish green, mesoscutum yellowish. Legs uniformly bluish green, tibial spines, tips of tarsi and claws, black. Membrane pale or slightly dusky, veins green; cubitus bordered by a yellowish calloused line. Dorsum clothed with prominent, erect, blackish hairs, also with pale ones on embolium and margins of pronotum, the whole intermixed with sericeous, silvery scale-like pubescence. Genital structures distinctive; postero-dorsal margin of genital segment with four chitinous processes, number one on the left side small and spine-like, the second arising near middle strongly sinuate, curving to the left side, apical half slender, needle-like and pointing distad; third process arising to right of median line, blade-like; fourth process arising to the right of and beneath the third, about the same length but more slender than the third. Dorsal lobe of left genital clasper terminating in a slender acuminate spine which in normal resting position points cephalad.

♀. Length 4.8 mm., width 1.8 mm. Head: width .91 mm., vertex .43 mm. Antennae: segment I, length .30 mm., yellowish; II, 1.01 mm., greenish yellow, becoming fuscous apically; III, .86 mm., fuscous; IV, .39 mm., fuscous. Pronotum: length .74 mm., width at base 1.44 mm.

Holotype: ♂ August 17, 1925, Gunnison, Colorado (H. H. Knight); author's collection. *Allotype:* August 25, 1925, Hudson, Colorado (H. H. Knight). *Paratypes:* 6 ♂, taken with the type on *Anogra coronopifolia* (T. & G.) where the species was breeding. ♀ August 26, 1925, Sterling, Colorado (H. H. Knight), taken on the same host plant as determined by Dr. L. H. Pammel. ♂ June 9, 1920, Fort Collins, Colorado.

Pseudopsallus abroniae n. sp.

A pale dusky form with antennae, calli, and arcuate marks on the frons fuscous; genital claspers distinctive.

♂. Length 5.7 mm., width 2.2 mm. Head: width .96 mm., vertex .39 mm.; eyes larger and tylus more prominent than in *sericatus* Uhler. Rostrum, length 2 mm., attaining posterior margins of hind coxae, dusky to fuscous, apical segment black. Antennae: segment I, length .35 mm., dusky, fuscous near base; II, 1.51 mm., cylindrical, nearly the thickness of segment I but more slender at base, dusky to fuscous, thickly clothed with rather short fuscous pubescence; III, 97 mm. more slender, blackish; IV, .32 mm., black. Pronotum: length .91 mm., width at base 1.77 mm.

General coloration dusky pale, with calli, arcuate mark each side of frons, sternum except side, tibial spines and tips of tarsi, fuscous to black. Legs dusky, femora with rows of obsolete fuscous dots. Mesoscutum moderately exposed, yellowish to orange colored. Membrane uniformly dusky or pale fuscous, veins paler. Clothed with prominent, erect, simple brownish hairs and rather sparsely intermixed with fine, recumbent, pale to yellowish sericeous pubescence, thicker on sides of abdomen. Genital structures distinctive, left clasper with dorsal lobe bluntly acuminate, apex armed with a pair of small spines; postero-dorsal margin of genital segment armed with three ventrally projecting chitinous spines, the right hand one blade-like, its apex widened and finely dentate.

♀. Length 5.9 mm., width 2.5 mm. Head: width .99 mm., vertex .48 mm. Antennae: segment I, length .38 mm.; II, 1.6 mm., cylindrical, more slender than segment I; III, .95 mm.; IV, .32 mm. Pronotum: length .97 mm., width at base 1.94 mm. More robust than the male but very similar in pubescence and coloration.

Holotype: ♂ August 25, 1925, Hudson, Colorado (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 24 ♂♀, taken with the types on *Abronia elliptica* where the species was breeding. 2 ♂ 1 ♀ June 10, 1900, Ft. Lupton, Colorado (E. D. Ball). ♂ April 26, 1903, Phoenix, Arizona.

Pseudopsallus tanneri n. sp.

Allied to *sericatus* Uhler, but distinguished by the longer and more slender black antennae, and in structure of the male genital claspers.

♂. Length 5.9 mm., width 2.9 mm. Head: width 1.03 mm., vertex .59 mm.; frons and base of tylus more prominent than in *sericatus.* Rostrum, length 1.2 mm., just attaining hind margin of sternum, green, last two segments black. Antennae: segment I, length .44 mm., fuscous to black, green at base; II, 1.66 mm., black, distinctly more slender than in *sericatus;* III, broken. Pronotum: length .78 mm., width at base 1.54 mm.

General coloration bluish green, basal line of scutellum, antennae, apical half of rostrum, tibial spines and tarsi, black. Membrane pale to dusky, veins bluish green. Clothed with prominent, erect, simple pale hairs and thickly intermixed with silvery white, sericeous to scale-like pubescence, being very much like *sericatus* in this respect. Genital claspers distinctive, left clasper with dorsal half vertical, sides parallel, not at all acuminate, dorsal edge curved slightly inward, broadly and rather deeply notched, leaving the dorsal angles acuminate and curved slightly cephalad; postero-dorsal margin of genital segment set with four prominent blade-like, chitinous projections, whereas *sericatus* has only two blades and a small spine.

♀. Length 5 mm., width 2 mm. Head: width 1.15 mm., vertex .74 mm. Antennae: segment I, length .44 mm.; II, 1.69 mm.; III, 1.35 mm.; IV, .47 mm.; greenish to fuscous, last two segments darker. Pronotum: length .80 mm., width at base 1.58 mm. More robust and hemelytra shorter than in the male, but very similar in pubescence and coloration.

Holotype: ♂ June, 1927, Mesa Verde National Park, Colorado (Vasco M. Tanner); author's collection. *Allotype:* June 11, 1915, beyond Jacumba, San Diego Co., California (Harold Morrison), from sage-brush; author's collection. *Paratypes:* 3 ♂ 2 ♀, taken with the allotype; unfortunately poorly preserved, but the male claspers are very distinctive and undoubtedly belong here. UTAH—2 ♂ June 23, 1913, Kanab (E. D. Ball). ♂, La Sal (Vasco M. Tanner). ♀ Aug. 4, 1921, Butte, Montana (F. M. Sallee). Named in honor of Dr. Vasco M. Tanner who collected and preserved the best male specimen.

Pseudopsallus davisi n. sp.

Distinguished from allied species by the prominent, erect, black hairs on the dorsum; probably more closely allied to *tanneri* as shown by form of left genital clasper, but the black bristle-like hairs and other characters separate it easily.

♂. Length 5.4 mm., width 1.7 mm. Head: width .93 mm., vertex .476 mm. Rostrum, length 1.17 mm., reaching to base of hind coxae, green, apex black. Antennae: segment I, length .30 mm., green, set with four or five black setose hairs; II, 1.17 mm., distinctly more slender than segment I, green to dusky, set with rather prominent black hairs and intermixed with some finer, paler pubescence; III, .82 mm., fuscous; IV, broken. Pronotum: length .74 mm., width at base 1.38 mm.

Color rather uniformly deep bluish green; femora with many setigerous fuscous points from which black hairs arise, tibia with prominent black spines but not arising from distinct spots, base and apex of tarsi blackish. Membrane uniformly pale dusky, veins pale to green, a calloused line bordering larger areole. Clothed with erect, black, bristle-like hairs on dorsum, vertex and apical half of venter, also a few white hairs on pronotum, head and embolium, the whole closely intermixed with sericeous to scale-like, silvery white pubescence. Genital structure distinctive; left clasper much as in *tanneri,* the dorsal lobe broadly notched above; posterodorsal margin of genital segment with a pair of chitinous processes on left of mesal line, much as in *tanneri,* but right side with a single, broad, flat process which terminates as a sharp spine at outer or ventral margin.

Holotype: ♂ July 15, 1929, Richfield, Utah (E. W. Davis), taken at light trap; author's collection. Named in honor of Mr. Edgar W. Davis who has favored the author with several interesting species of Miridae.

Pseudopsallus nicholi n. sp.

Allied to *demensus* Van D., but genital structures show distinctions; smaller and more delicate than *demensus,* pale to bluish green; dorsal lobe of left clasper more rounded at apex, whereas in *demensus* the apex is acute.

♂. Length 4.4 mm., width 1.5 mm. Head: width .87 mm., vertex .41 mm. Rostrum, length .97 mm., scarcely attaining hind margin of sternum, yellowish, apex black. Antennae: segment I, length .30 mm., greenish yellow; II, 1.3 mm., cylindrical, scarcely equal to thickness of segment I, yellowish to green, becoming fuscous apically; III, 1.1 mm., fuscous; IV, .41 mm., fuscous. Pronotum: length .68 mm., width at base 1.3 mm.

Color pale to bluish green, legs yellowish, pronotum, hemelytra and venter more greenish. Membrane pale to slightly dusky, veins pale to greenish, an opaque calloused spot bordering apex of larger areole. Clothed with moderately prominent, simple, white pubescent hairs and intermixed with silvery white, sericeous to scale-like pubescence. Genital structures distinctive; dorsal lobe of left clasper with sides nearly parallel, dorsal extremity rounded off and not acute as viewed from the side, although viewed from above the inner edge with a slight projection; postero-dorsal margin of genital segment with two flat blade-like chitinous projections, one arising each side of mesal line, curving mesad, their tips nearly touching.

♀. Length 4.3 mm., width 1.6 mm. Head: width .87 mm., vertex .47 mm. Antennae: segment I, length .30 mm.; II, 1.34 mm., distinctly more slender than segment I; III, 1.08 mm.; IV, .39 mm.; yellowish green, last two segments becoming fuscous. Pronotum: length .69 mm., width at base 1.34 mm. Form slightly more robust than the male, but very similar in pubescence and coloration.

Holotype: ♂ June 14, 1928, alt. 6000 ft., Huachuca Mts. (A. A. Nichol). *Allotype:* same data as the type. *Paratype:* ♀, taken with the types.

Pseudopsallus demensus (Van D.).

I have a male paratype of *Orthotylus demensus* Van D. and find that the male claspers and other characters refer this species to the genus *Pseudopsallus.* I have taken the species on *Gaura coccinea* Pursh. where it was breeding July 31, 1927, Moorecroft, Wyoming, also July 30, Sundance, Wyo., and Aug. 19, 1927, Custer, South Dakota. Also have a specimen labeled June 24, 1920, Fort Collins, Colorado (G. M. List).

English Sparrows Eating the Japanese Beetle.—On Sunday, July 7th, the writer observed several English sparrows capturing Japanese beetles on a rose bush in the yard of a neighbor. The sparrows hovered over the bush and when they located a beetle, deftly removed it from the leaf upon which it was feeding, took it to the sidewalk or a bare patch of ground, where it was quickly killed and eaten. Apparently this despised sparrow has some good traits.—E. L. Bell, Flushing, N. Y.

Copaeodes minima Edwards from Florida.—Several specimens of this diminutive Hesperid butterfly were collected by Mr. George P. Engelhardt, at Gainesville, Florida, on March 8th and 30th, 1929. This seems to be the first recorded occurrence of *minima* from Florida.—E. L. Bell, Flushing, N. Y.

VARIATION IN LEPIDOPTERA.

By T. D. A. Cockerell, Boulder, Colo.

Mr. Gunder's interesting article in the December Bulletin suggests a few comments. Names exist to facilitate reference to objects which interest us. We name every individual of *Homo sapiens.* In recent years there has been a great development of interest in various aspects of evolution, genetics and geographical distribution, and Lepidoptera are found to be very useful for such studies. Hence it has come about that for some people and for some purposes varieties and races are more interesting than species, because they throw more light on the workings of the evolutionary mechanism. It does not seem possible to say in advance what complexities of nomenclature are desirable, but naming goes too far when it involves differences which for our purposes are not significant.

It seems simple to say that we will name significant variations from the type which are due to germinal modifications, but will not name those which are the direct result of environmental factors. Thus, on this basis, Mr. Gunder logically rejects various "minor" varieties, which may be supposed to be due, at least frequently, to lack of sufficient food in the larva state. But the difficulty we meet is this, that objectively, upon inspection, it is often impossible to distinguish between the effects of environment and true mutation. Any study of species teaches us that size is very frequently a specific character, and it must also be, in numerous instances, of racial significance. We already know much about chromosome changes in relation to size among plants. But again, Mr. Gunder fully recognizes melanism in his system of named varieties or forms, but has he inspected the remarkable figures of *Vanessa* (*urticae, io, polychoros* and *antiopa*) in Schröder's Handbuch der Entomologie, Bd. 2, pp. 476–477 (1926)? We are there shown (1) the normal form, (2) the effects of moderate cold, (3) the effects of extreme cold, (4) the effects of warmth, and (5) the variation due to extreme heat. The striking aberrations produced by extremes of heat and cold are practically the same, and are given the same names, viz. *V. urticae* ab. *ichnusoides* Selys., *V. io* ab. *antigone* Fisch., *V. polychloros* ab. *testudo* Esp., *V. antiopa* v. *hygiaea* Hdrch. *V. cardui* ab. *elymi* Rbr. is another modification of the same sort. It is not therefore to be inferred that melanism is always due to heat or cold, but the point is that we cannot determine the cause on mere inspection of the specimens. We are apparently obliged to record these variations by name—and the records are of value—but to leave it to the future to determine how they are caused. Yet, as experimental evidence accumulates, we are more and more able to make reasonably correct inferences.

There are certain kinds of variation which are worth critical study, but are not covered by Mr. Gunder's rather artificial scheme.

(1.) Any one who inspects a good series of a large genus, such as *Papilio,* can see that there are various progressive tendencies in shape, markings and color which culminate in series of diverse species. Now it should be of interest to seek the beginnings of these changes, or to record the variations of one species which are in the direction of the normal form of a related one. Thus it may well happen that very slight modifications may sometimes be worth noting, when making an evolutionary study of a group.

(2.) There are races which appear nearly alike, and yet certainly, or almost certainly, arose independently. When we suspect independent origin, we may be guided by very small peculiarities, which tell the story. (Collectors of postage stamps know this well!) In practice, it is doubtless best to retain the same name for races appearing identical, but existing in different regions, until it is possible to prove diversity of origin.

From the standpoint of nomenclature, I think the races or subspecies, though expressed by trinomials, should rank with species. That is, the racial name should not be repeated within the genus and the first published name takes precedence, whether published as a species or as a subspecies. The intermediates found where the ranges of subspecies meet are presumably nearly always due to crossing.

The mutation, aberration or form should I think stand in a different category. For various reasons, which I need not discuss, it seems better (1) not to give priority as a specific name, when a named aberration has been found to belong to a species not hitherto separated; and (2) the use of the same term for parallel aberrations within the genus, or in races of one species, should be permitted and encouraged.

RECORDS OF ANTHOCORIDAE, PARTICULARLY FROM NEW YORK.

J. R. de la Torre-Bueno, White Plains, N. Y.

This, like many other notes, started to be a mere listing of localities and biological facts out of my collection and field journals. But in its course, it became necessary to check up many determinations. Hemiptera of Connecticut, while eminently usable and entirely accurate, did not go far enough; and it was necessary to have recourse to the original sources for the study of anthocorids—Reuter's masterly monograph of 1884, 46 years old, but still the standard work; and Poppius' Beiträge of 1909. Restricted keys for the species of the Eastern States were drawn up from the literature; and they are here offered as an aid to the identification of our own northern forms without the injection of tropical and subtropical species not as yet found with us and unlikely to occur so far North. One genus and its species (*Xenotrachelliella inimica* D. & H.) are not included because none of the key characters used by Reuter appears in the descriptions, which are largely by color, following the European obsolescent practice. While these keys are at times similar to those in Blatchley, it is because they are drawn from the same sources. Where they differ (and where names also differ) it is because Reuter has been followed closely.

In keying the subfamilies I endeavored to find from the literature some stable yet visible character other than the hamus of the cell of the second pair of wings—but all the authors consulted offered no other. This, of course, is a perfectly valid character, but it calls for the practical destruction of a delicate specimen before it can be seen. A monograph of the family is now in progress at Ames, Iowa, so it is hardly worth while to go to the pains and research required, when my present purpose is merely to offer practicable and practical keys to supplement the eminently usable ones in Hemiptera of Connecticut.

Key to the Family Anthocoridae.

1. Third and fourth segments of antennae slender, linear, beset with long hairs 2
   Third and fourth segments of the antennae fusiform, with short hairs .... Subfamily ANTHOCORINAE

2. Cell of the second pair of wings with a hamus or hook-like interior vein ....Subfamily LYCTOCORINAE
Cell without a hamus .... Subfamily DUFOURIELLINAE

KEY TO GENERA OF LYCTOCORINAE.

(From Hemiptera of Connecticut.)

1. Channel of metasternal orifices curved forward, or backward, with rounded angle, fine carina lacking..................2
Channel of metasternal orifices nearly straight, joining at a sharp right angle a very fine carina which extends to the anterior pleural margin .... *Lyctocoris* Hahn
2. Channel curved forward; pronotal margins not distinctly ciliate 3
Channel curved backward, toward apex; pronotal margins ciliate .... *Lasiochilus* Reuter
3. Channel long, curved at middle, and almost, or quite, reaching the margin of the metapleura .... *Xylocoris* Dufour
Channel shorter, curved near apex, not nearly reaching margin of metapleura .... *Asthenidea* Reuter

While Hemiptera of Connecticut gives only one of the genera—*Xylocoris,* with one species—as found up to that time in the State, all four genera are found in New York or the neighboring states, so their occurrence in Connecticut is only a matter of finding the specimens.

KEY TO LYCTOCORIS Hahn.

(Adapted from Reuter.)

1. Membrane with only one (the external) vein quite distinct; (first segment of rostrum not shorter than head, extending slightly beyond base of eyes); 3.5 to 3.8 mm. long.
campestris Fab.
Membrane with four veins, all, or nearly all, equally distinct, raised 2
2. Rostrum extending scarcely beyond the intermediate coxae, first segment extending to the middle of the eye.
(subgenus *Metriosteles* Reut.)
Rostrum reaching hind coxae; first segment at least as long as head...3
3. First segment of rostrum as long as head; second segment of antennae but little longer than the width of the head including the eyes; 4 mm. long .... *stålii* Reut.

First segment of rostrum nearly reaching apex of prosternum; second joint of antennae 1/3 longer than the width of the head; 4.5 mm. long........................*elongatus* Reut.

Lyctocoris campestris Fabr., 1794.

This widespread European form is recorded from Quebec to Texas and Colorado. It is listed from the State in the New York list, but not from Connecticut in Hemiptera of Connecticut. All the following records are new.

Indian Lake, Sabael, N. Y., August 31, 1921 (Notman): White Plains, N. Y., June 19, 1915, and October 17, 1908, on glass pane of door (J. R. T. B.). Cornwall, Conn., July 22, 1924 (Frost). Buffalo Lake, Minn. (No other data).

Lyctocoris stålii Reut., 1871.

Southern Pines, N. C., Jan., 1911 (A. H. Manee). *Lyctocoris canadensis* Prov. is not keyed because no key characters are given in the description. Blatchley records *L. elongatus* from Lakehurst, N. J.—probably taken by Mr. Wm. T. Davis. *L. stålii* figures in the New York List from the State.

KEY TO LASIOCHILUS REUTER.

(Adapted from Reuter.)

Pale or fuscescent testaceous; entire clavus most distinctly subseriately punctate, a series of piliferous punctures on the corium parallel to the claval suture. (Apex of embolium as wide as the apex of the corium; margin of pronotum and of embolium with long cilia, first joint of rostrum scarcely reaching apex of head.) 2.5 to 3.33 mm. long.
pallidulus Reuter

Obscure fuscous; clavus hardly or obsoletely punctate: (Margin of pronotum with short cilia; margin of hemielytra with long cilia; rostrum reaching intermediate coxae; apex of first joint of rostrum nearly reaching eyes). 2.75 mm. long.
fusculus Reuter

Lasiochilus pallidulus Reuter is known from South Carolina, Florida and Texas southwest. It may at some time be found in the pine barrens of Long Island; and is therefore noted here.

Lasiochilus fusculus Reuter.

This species has an extensive range—from New York south and west into New Jersey, Indiana, South Carolina, Tennessee, Mississippi, Florida and Texas. The New York State List records it from Hamburg.

KEY TO XYLOCORIS DUFOUR.

(=*Piezostethus* Fieber.)

(Adapted from Reuter.)

1. Channel of metasternal orifices long, margins even, the internal scarcely expanded into a wide smooth area........2

   Channel of the metasternal orifices transverse, scarcely curved, prolonged into a curved shining area. (Entire hemielytra very shining). 2 mm. long..............*vicarius* Reuter

2. Channel of the metasternal orifices extremely long, prolonged into a carinate-acuminate apex, which reaches the basal margins of the pleura. Hemielytra somewhat shining, always at least as long as the abdomen or hardly shorter. (Hind tibiae finely pilose, devoid of long hairs); larger species, at least 2.5 mm. long..........................3

   Channel of the metasternal orifices prolonged in a carina, not much acuminate toward apex and most distinctly abrupt a little below the basal margin of the pleura; 2.25 to 2.5 mm. long.................................*cursitans* Fabricius

3. Hemielytra whitish; apex of the clavus and the cuneus, the suture of the membrane only and sometimes its exterior margin, narrowly fuscous; channel of the metasternal orifices curved in an obtuse angle; 2.3 to 3 mm. long.
galactinus Fieber

   Hemielytra sordid white or greyish; commissure and clavus and frequently its scutellar edge and the embolium black or piceous, the blackening sometimes quite extensive; channel of metasternal orifices curved in a very obtuse arc; 2.75 mm. long............................*sordidus* Reuter

There are actually five species of this genus in the Eastern part of this country, but the fifth—*Xylocoris betulinus* D. & H.—could not be fitted into this key because of the absence in its description of the characters herein used. The genus figures in most of our lists as *Piezostethus* Fieber.

Xylocoris galactinus Fieber.

This species has heretofore been recorded from this country from New York, Illinois, Georgia and Florida; the New York List gives it from Lake Placid (in the Adirondacks); and Blatchley adds Roselle Park, N. J.—now Roselle—probably from the collections of Mr. H. G. Barber. I have taken it in White Plains (September 2, 1916) by sweeping, this being another New York record.

Xylocoris sordidus Reuter.

Van Duzee gives its range as New York, Pennsylvania and Texas; Blatchley records it from Florida; and the New York List gives it from White Plains. This last record, however, may be based on a misidentification of *X. vicarius.*

Xylocoris vicarius Reuter.

This is the species that has frequently been reported as *Piezostethus sordidus* by myself and by others. It has also gone under the name of *cursitans.* Careful checking with Blatchley's keys led this species to this name. My own key preceding repeatedly gave the same result. According to Blatchley this is a Floridian species. Reuter described it from "Am. Sept." The form of the metasternal channel is distinctive. This species is the common dark brown or piceous, apterous species to be found nearly at all times of the year in dampish spots, under the bark of dead trees, running about with *Scolopendrella* and sundry small beetles, principally Staphylinids. The nymphs are bright red, but otherwise superficially resemble the apterous full grown bug. Records of this species are as follows:

New York—McLean, Tompkins Co., July 14, 1919, under bark of recently cut white pine; L. I., Cold Spring Harbor, August 3, 1920; Westchester Co., White Plains, (years omitted), March 11 and 21, March 22 (under bark of dead apple tree), March 31 (under bark of dead tulip tree), April 12, (these specimens also were found under the bark of a dead and fallen apple tree, in the moist, dark spots, together with various Collembola, and a couple of bright red nymphs were also noted, probably in the last instar), May 22, June 2, July 4 (in flight), September 26.

Leeds, Massachusetts, April 6, 1919; Ridgefield, Conn., September 1, common under damp bark; Westfield, N. J., June 19, 1904;

Lakehurst, N. J., July 7. (This specimen was determined by the late Otto Heidemann as *Xylocoris americanus* Dallas).

Xylocoris cursitans Fallen.

This species, heretofore recorded from New York and elsewhere is probably a misidentification of the preceding. However, the following records appear to be of the true species. White Plains, N. Y., August 24, 1907. Westfield, N. J., August 14, and September 4, 1904.

ASTHENIDEA REUTER.

In this genus there is only one species in our limits—

Asthenidea temnostethoides Reuter.

It is recorded from Illinois by Blatchley; is reported in the New York List from Cranberry Lake; and by Drake and Hottes from Batavia—both localities in the northern part of the State.

KEY TO GENERA OF ANTHOCORINAE.

(From Hemiptera of Connecticut.)

1. Pronotum trapezoidal, its outline not continuous with that of the head; membrane with three or four veins............2
   Pronotum conical, becoming cylindrical anteriorly and forming a continuous outline with the elongate head; membrane with one vein.......................*Macrotrachelliella* Champion
2. Collar of pronotum distinct; membrane with four veins.....3
   Collar obsolete; membrane with three veins.....*Orius* Wolff
3. Sides of pronotum not explanate; corium not or obsoletely punctate; metasternal canals not elevated at lateral ends. *Anthocoris* Fallén
   Sides of pronotum explanate, extending anteriorly more or less beyond base of collar; corium distinctly punctate; canals prominent laterally....................*Tetraphleps* Fieber

The genus *Anthocoris* contains only one species within our limits, which is that heretofore named *A. borealis* Dallas, but *Anthocoris musculus* Say appears to be its proper name. This was adumbrated in Hemiptera of Connecticut by Parshley and adopted as the correct name by Blatchley. An independent checking by myself to establish which was right led to this result. A comparison of Say's description of *Reduvius musculus* from the

Northwest Territory and Dallas's *Anthocoris borealis* from Hudson Bay Region might lead to the idea that they are doubtfully the same. However, a checking of the same specimens with the two original descriptions leads to the certainty of their identity. We may regard the synonymy to be now definitely established. Nevertheless, it may be that the descriptions refer to some Western and Northern form; and thus ours may be without a name.

Parenthetically, here are two descriptions which for their time are relatively full. Yet, judging by the descriptions alone, it might seem that we had two different species. But with a sufficiency of specimens in hand, we can find that the two descriptions fall within the limits of variation of the species. In measuring specimens, I found the smallest to be 3 mm. long and the largest 3.75 mm. All the specimens were from within a range of 5 miles from White Plains in Westchester County, N. Y.

Wherever there are beeches is the place to look for *Anthocoris*. These little bugs are to be found in the curled over edges of certain of the bleached leaves, in abundance. Each leaf will harbor generally three or four, sometimes more, sometimes fewer. My notes of August 4 of this year, when I found them in numbers on Petra Island in Lake Mahopac, Putnam County, N. Y., are rather full and follow here:

The beeches showed the usual bleached and curled-edged leaves. Inspection of these showed concealed in them the usual *Anthocoris musculus,* mostly adults, but here and there a nymph. However, not every curled leaf is tenanted. The abundant curled leaves of one small sapling—almost bush-like—did not yield a single specimen. But here and there, in the scattered bleached leaves within reach, of the larger trees, and quite frequently in those of the larger saplings, the bug was to be found.

The undersides of these bleached and dried leaves were covered with dry cast skins of a white, colorless aphid and a mite; and the curled over edges shelter small pale spiders and their webs in the hidden channels or leafy tunnels. It is in these tubes or channels that *Anthocoris* hides. These channels are more or less filled with a sticky dirt, remnants of cast skins, threads like micelia of fungi, etc., and here the 1 mm. long young aphids are hidden.

Light on the preceding is cast by a recent article in the Entomologists' monthly magazine (LXV, pp. 103–4), by W. Stern, on the fauna of *Rubus* sp. He notes *Anthocoris nemorum* as attacking the aphid *Amphorophora rubi,* various jassids and two mites, one being the universal *Tetranychus telarius* L., which also appear to be its diet in the trees it frequents. The species hibernates as an adult.

The species is recorded extensively in the New York List under both names. To these records from New York may be added the following, heretofore unpublished. WESTCHESTER COUNTY: Armonk, May 5, 1924; June 14, 1914. Wampus Lake (vicinity), June 6, 1923, swept. Valhalla, August 18, 1923; "a beech with bleached and curled leaves when beaten yielded with little effort many" and "there flew out from it numbers of a white aphid." White Plains, June 5, 1924, from alder; June 22, 1919, 1 nestling in terminal bud of black alder; July 1, 1923, 1 on aspen; July 5 and 6, 1924, from beech, as usual; July 29, 1922, "about 30 from Beech;" August 10, 1921; September 4, 1921, "on the beech leaves as before." Hartsdale, July 5, 1924. PUTNAM COUNTY: Lake Mahopac, August 2, 1929. LONG ISLAND: Cold Spring Harbor, July 30, 1920; August 21, 1924.

Outside of New York, I have the species from Parry Sound District Ontario, Canada, July 26, 1915, H. S. Parrish Collector; from Portland, Maine, one specimen, May 13, determined by Ashmead as *Anthocoris antevolens* B. White; from Framingham, Mass., taken by A. C. Frost, 1 May 29 and another September 29, 1929.

KEY TO TETRAPHLEPS FIEBER.

(Adapted from Blatchley and the Original Descriptions.)

1. Length of antennae equal to width of head including eyes . . 2
   Length of antenna greater than width of head including eyes. *uniformis* Parshley
2. Beak reaching between middle coxae . . . . *osborni* Drake
   Beak not reaching middle coxae . . . . *americana* Parshley

This key has been checked systematically with the original descriptions; and with the descriptions in Blatchley. There is a sigular lack of consistency and symmetry in all of them. The characters on which the specific differentiation is made are not similarly stated for each species—that is, they are not strictly comparable one with the same in another species. For example, Blatchley, taking his characters from the descriptions, thus characterizes the first segment of the antennae: *americana*—segment I reaching the middle of cheeks; *osborni*—segment I equal to 3/5 of III; *uniformis*—not mentioned. It may readily be seen that there is here no common denominator for this character, which accordingly becomes vague in use. This is true of practically all the other characters employed. I have argued elsewhere that a description is not an elegant exercise for those that know all about a species, but that it is for the very practical purpose of informing some one who knows nothing about it; or for the purpose of affording a foundation for a critical study on the part of one who does. *Tetraphleps canadensis* Prov., not keyed or referred to elsewhere here, is obviously a *Tetraphleps*, according to Van Duzee, but so vaguely described that it is impossible to place it specifically in the absence of the type. It is conceivable that some cognate species to those mentioned may some day be discovered, which it may not be possible to recognize as different from any description published, because of the absence of the true critical character.

Tetraphelps americana Parshley.

This species is recorded from New York; from Maine, whence it was described; and from Ottawa, Canada, by Dr. Blatchley. I have a specimen from Claremont, N. H., collected by Mr. G. P. Engelhardt, a new distributional record.

The other two species are recorded from New York in the State List, although both seem northern.

MACROTRACHELIELLA CHAMPION.

Of this genus there appears to be only one northern species, *Macrotracheliella nigra* Parshley.

The species is known from Massachusetts and Rhode Island; and is recorded from Staten Island, N. Y., in the State List. I beat it in numbers from scrub pine in company with *Aradus cinnamomeus*, at Lakehurst, N. J., June 29, 1911. This record extends the distribution of the species further south. Likewise, it might appear that it should be found in the pine barrens of Long Island and of Connecticut if sought for at the proper time.

KEY TO ORIUS WOLFF.

(= *Triphleps* Fieber.)

Basal half of clavus blackish brown .... *insidiosus* Say
Clavus entirely black .... var. *tristicolor* B. White

Orius insidiosus is our widespread American species. It occurs throughout the State of New York; and is, of course, common about White Plains and in Westchester County in general. I also have it from Southern Pines, N. C. (A. H. Manee), May and September, 1911. From Woodgate, I received it from Jemez Springs, New Mexico, dated May 25, 1915.

The var. *tristicolor*—a mere color form, scarcely worthy of a name—has been taken at Ithaca on July 16, 1919, sweeping and at White Plains, May 31, 1924, also sweeping, in a damp meadow.

The last of the subfamilies, the Dufouriellinae, is not mentioned in Hemiptera of Connecticut, but Blatchley records it in his Manual, giving and keying six genera, of which three by their general distribution should be found in the Northeastern States, one of them being already recorded from New York in the State List.

KEY TO GENERA OF DUFOURIELLINAE.

(Adapted from Reuter.)

1. Anterior femora unarmed 2
   Anterior femora incrassate, dentate beneath. *Scoloposcelis* Fieber
2. Base of pronotum quite deeply sinuate (first segment of antennae hardly reaching apex of the head; anterior femora hardly thicker than posterior). *Dufouriellus* Kirkaldy (=*Xylocoris* Westwood)
   Base of pronotum slightly sinuate (femora elongate). *Cardiastethus* Fieber

KEY TO CARDIASTETHUS FIEBER.

Membrane unicolorous or with only a narrow hyaline line next to the apex of the membranal suture (head transverse; base of pronotum more than twice its length); veins free, interior weak; length, 1.75 mm. .... *pergandei* Reut.

Membrane fusco-fumate, a vittula in the interior angle and a subtriangular spot at the exterior basal angle; only first and fourth veins of the membrane distinguishable, the second and third quite obsolete; length 2.4 mm. ......*luridellus* Fieber

Cardiastethus pergandei Reuter appears to be known only from the District of Columbia. *Cardiastethus luridellus* was described originally from Pennsylvania, and that remains its sole record.

Dufouriellus Kirkaldy is represented in our northeastern fauna by only one species, *D. ater,* Dufour, a Palaearctic species recorded in the New York State List from Hamburg, N. Y.

The genus *Scoloposcelis* likewise has only one representative with us, *S. flavicornis* Reuter, described from Texas, and since recorded from Pennsylvania, Florida and Indiana.

A LIST OF COLEOPTERA FOUND AT FLUSHING AND NEW TO LONG ISLAND.

By Kenneth W. Cooper, Flushing, New York.

The following species of Coleoptera, collected by the writer at Flushing, are new additions to the Long Island records of the New York State List of Insects. Although, by their normal distribution, a great number of the species in this list would naturally occur upon the Island, there are a few in the list that one would not ordinarily expect to find here. Among the latter there are two species new to the United States, and two species new to New York State, as far as the author could determine. The specimens were all taken during the past three years.

The numbers preceding the species are those of the Leng Catalogue. Letters in parentheses indicate the determiner of the species, *i.e.*, (B)—Mr. H. S. Barber, (F)—Mr. W. S. Fisher, (L)—Mr. Chas. W. Leng, (M)—Mr. Mutchler, (N)—Mr. H. Notman, and (S)—Mr. Chas. Schaeffer. Lack of initials after the date of capture means that the writer has determined the species.

Family Carabidae.

.... *Asaphidion flavipes* L. May (N). A number of specimens were found under a shingle in an open field. New to the U. S.

1097 *Euferonia lachrymosa* Newm. June.

Family Hydrophilidae.

2854 *Laccobius agilis* Rand. September (S). Found in damp sand at stream edge.

2893 *Cercyon analis* Payk. September (S).

Family Orthoperidae.

3252 *Sericoderus lateralis* Gyll. September–December (S). Found by sifting leaves, grass and debris at base of trees.

Family Staphylinidae.

4526 *Staphylinus badipes* Lec. July.

4666 *Tachinus picipes* Er. August.

Family Histeridae.

6565 *Hister laevipes.* September (S). Three specimens. New to New York State.

6571 *H. interruptus* Beauv. September (S).

6586 *H. foedatus* Lec. September (S).

6606 *H. depurator* Say. September (S).

6723 *Paromalus aequalis* Say. November. Found in great numbers under bark of dead oaks.

6724 *Isolomalus bistriatus* Er. September (S). Two specimens were found under moist bark of dead oak.

6790 *Acritus exiguus* Er. November (S). Under moist bark, and in fungi under bark.

FAMILY LAMPYRIDAE.

6979 *Lucidota decipiens* Harr. June.

FAMILY CANTHARIDAE.

7061 *Podabrus diadema* Fab. June.

7062a *P. modestus* var. *flavicollis* Lec. March (M). Found, alive, under bark.

FAMILY MELYRIDAE.

7238 *Malachius aeneus* L. May.

FAMILY MELOIDAE.

8158 *Zonites bilineata* Say. July (B). Mr. Ballou has taken this species in Westchester Co., New York. (This is a new record for New York State.)

FAMILY ANTHICIDAE.

8359 *Anthicus sturmi* Laf. December. Found under bark, with *Derodontus maculatus,* in rotted fungi.

FAMILY ELATERIDAE.

8853 *Melanactes piceus* DeG. June.

8936 *Elater sellatus* Dej. March (S).

9036 *Melanotus fissilis* Say. March.

FAMILY BUPRESTIDAE.

9408 *Chrysobothris lecontei* Lg. June. Found running along the branches of a dead oak.

9522 *Agrilus cephalicus* Lec. June (F). Beaten from oak.

.... *A. frosti* Knull. June (F). Beaten from oak.

FAMILY BYRRHIDAE.

9893 *Porcinolus undatus* Melsh. January–September. Taken, in January, hibernating in rotten log. From June till September specimens were taken from about the roots of grasses growing in a sandy locality.

FAMILY NITIDULIDAE.

10078 *Epurea rufida* Melsh. November. On grape-fruit rind.

FAMILY RHIZOPHAGIDAE.

10144 *Rhizophagus bipunctatus* Say. October–November (S). Under the bark of hickory and oak.

FAMILY MONOTOMIDAE.

10159 *Monotoma picipes* Hbst. October (M). Sifted from the nest of a mouse in large numbers.

FAMILY CUCUJIDAE.

10225 *Laemophloeus fasciatus* Melsh. November. From under the bark of cherry.

FAMILY EROTYLIDAE.

10292 *Acropteroxys gracilis* Newn. July. This species has also been taken at Roslyn, L. I., by Mr. Ballou.

10292a *A. gracilis* var. *inornata* Rand. May.

10334 *Triplax thoracica* Say. January (S). A number of specimens from a hardened fungus.

FAMILY DERODONTIDAE.

10353 *Derodontus maculatus* Melsh. December. From fungi under loose bark.

FAMILY CRYPTOPHAGIDAE.

10360 *Telmatophilus americanus* Lec. September (S).

10488 *Ephistemus apicalis* Lec. September (S). Both adults and newly emerged imagos sifted from the nest of a field-mouse along with *Monotoma picipes.*

FAMILY COLYDIIDAE.

.... *Bitoma crenata* Fab. May–November (S). A European species which has been found in numbers under the bark of willow, oak and cherry. New to the U. S.

10576 *Aulonium parallelopipedum* Say. January (M). Two specimens from oak.

10580 *Colydium lineola* Say. December 15. Under the bark of a Scolytid-infested oak.

FAMILY LATHRIDIIDAE.

10646 *Enicmus aterrimus* Mots. December (S). On oak-infesting bracket-fungi.

FAMILY COCCINELLIDAE.

10998 *Stethorus punctum* Lec. December (S). Two specimens in fungi inhabited by *Ennearthron thoracicorne* Ziegl.

11202a *Anatis quindecimpunctata* var. *mali* Say. July. It has also been taken by Mr. Arthur Killen at Long Beach.

11178 *Neoharmonia venusta* Melsh. September (B). Found upon an aquatic plant at Kissena Lake, Flushing. New to New York State.

FAMILY TENEBRIONIDAE.

12308 *Hoplocephala viridipennis* Fab. September–November. Often found in association with *H. bicornis* Fab. under bark.

12323 *Platydema americanum* Cast. & Brll. September (S). Found under bark with the following species.

12327 *P. picilabrum* Melsh. September (S).

12377 *Hypophloeus thoracicus* Melsh. December (S). Two specimens from under oak bark.

FAMILY ANOBIIDAE.

12695 *Trichodesma gibbosa* Say.

FAMILY CISIDAE.

12979 *Cis creberrima* Mell. November (S). From bracket-fungi.

12992 *Orthocis punctata* Mell. December (L). From bracket-fungi.

FAMILY SCARABEIDAE.

14022 *Trichiotinus assimilis* Kby. August (S).

FAMILY CERAMBYCIDAE.

14532 *Leptura mutabilis* Newn. May.

15003 *Lepturges facetus* Say. June.

FAMILY CHRYSOMELIDAE.

15218, 15210 *Donacia rufa* Say. August. On water plants.

15655a *Zygogramma suturalis* var. *casta* Rogers. June (S). Found with *Z. suturalis.*

15699 *Phaedon viridis* Melsh. January. Found under loose bark.

15993 *Mantura floridana* Cr. May–November (S). Found during the summer on rag-weed. In the winter it is found by sifting.

16130 *Microrhopala xerene* Newn. July.

FAMILY CURCULIONIDAE.

16348 *Rhynchites bicolor* Fab. July (M).

16369 *Attelabus rhois* Boh. August.

16392 *Apion pennsylvanicum* Boh. June.

16679 *Brachyrhinus rugifrons* Gyll. June.

18020 *Cossonus platalea* Say. July (M).

18087 *Rhodobaenus tredecimpunctatus* Ill. June.

FAMILY SCOLYTIDAE.

18475 *Ips pini* Say. June (F).

SOME TINGITIDAE FROM BRAZIL (HEMIPTERA).

By Carl J. Drake, Ames, Iowa.

The present paper deals with a small collection of lace bugs from Bahia, Brazil, kindly sent to the writer by Dr. Gregorio Bondar for study. The collection is represented by eleven species and a variety, two of which are described below as new.

Monanthia parmata Distant.
Teleonemia aterrima Stål.
Teleonemia morio Stål.
Teleonemia scrupulosa Stål.
Sphaerocysta globifera Stål.
Amblystira silvicola Drake.
Corythucha fuscomaculata Stål.
Leptopharsa illudens Drake.
Not recorded heretofore from South America.

Leptopharsa illudens variantis n. var.

Differs from the typical *illudens* in having the costal area of the elytra composed of one complete and about or little over a half of an additional row of areolae along its distal half. Color, size and other characters very similar to *illudens*. In *illudens*, the type and paratypes from Porto Rico and Jamaica are before me, the costal area is entirely biseriate.

Holotype (male) and *allotype* (female), Bahia, Brazil, in my collection. Paratypes in collections of Bondar and Drake.

Tigava bondari Drake.

This species is most closely allied to *T. mollicula* Drake from Brazil. It differs from *mollicula* in having a little shorter rostrum, slenderer and shorter spines on the head. The head is also distinctly less tumid above. Color, size and general appearance are very similar to *T. mollicula*.

Gargaphia concursa n. sp.

Allied to *G. trichoptera* Stål, but differing from a cotype before me in having a larger hood, the paranota more sharply angulate, shorter discoidal area, and the median carina quite sharply raised a little behind the hood. Length, 4.30 mm.; width, 2.01 mm.

Head black, with five rather long sharp spines, the median longest and considerably longer than the others. Rostrum reaching to the transverse laminae. Ostiolar canal prominent and wider than in *G. trichoptera.* Pronotum black, considerably swollen, the posterior process testaceous and reticulate. Carinae considerably raised, testaceous, each composed of a single row of rather large areolae; lateral carinae parallel, extending anteriorly to base of hood but widely separated from it; median carina sharply raised a little behind the hood. Hood testaceous, about twice as large as in *G. trichoptera,* strongly compressed laterally. Paranota testaceous, broad, mostly triseriate, quite sharply angulate opposite humeri. Antennae long, brown to ferrugineous, the apical segment black; segment I shorter and two and a half times as long as two; III very long, three times as long as four, the latter distinctly longer than first two conjoined.

Elytra broad, the apices rather widely separated, costal area broad, with five rows of areolae at its widest part, with three or four transverse or oblique, fuscous, enlarged nervures; subcostal area narrow, biseriate; discoidal area moderately larger, narrower in male than in female, narrowed at base and at apex, with a brown spot (nervelets) at base, with four or five areolae at its widest part. Wings about as long or a little longer than abdomen. Legs long, slender, brownish testaceous, the tarsi darker. Claspers in male large, strongly curved.

Holotype (male) and *allotype* (female), Bahia, Brazil, collected by Dr. Gregorio Bondar, in my collection. Paratypes, taken with type, in collections of Bondar, Drake and Iowa State College.

THE USE OF PARADICHLORBENZENE IN THE INSECT COLLECTION.

J. R. de la Torre-Bueno, White Plains, N. Y.

Insect collections have three foes—grease, mould, and destructive insects. The first problem is solved by putting the greased insect, according to its kind, in some efficient grease solvent–chloroform, ether, benzene, gasoline, or carbon tetrachloride. Mould is fought by means of abundant naphthalene in the boxes. This treatment also keeps out and to some extent destroys *Anthrenus*. At times, however, the tightest fitting boxes become infested, either through some oversight, or by the introduction of some new specimens without fumigation. The usual practice has been to treat infested boxes or collections with carbon bisulphide, which, of course, killed the *Anthrenus;* but which, on the other hand, has a most vile odor, is poisonous to human beings, highly explosive, and potent only for a short time.

Paradichlorbenzene may be used in place of the bisulphide with marked advantage. It is a slower, (in minutes) killing agent but just as sure as the bisulphide. And this very slowness causes it to remain active in the boxes for months, at least. It is also much cleaner and more easily handled, as it comes in the form of small crystals (the commercial grade used for the peach-tree borer). And further it is much safer than the bisulphide because neither explosive nor inflammable. It is also as economical as the bisulphide.

In my practice, I combine three treatments in one—naphthalene, paradichlorbenzene and carbon tetrachloride. In one corner of the box I put, in a small heap, one teaspoonful (heaping) of the paradichlorbenzene and the naphthalene, and pour on a little carbon tetrachloride, about 1 teaspoon, also. This last dissolves the other two crystalline chemicals and consolidates them in one place, so they cannot slide about the box when it is moved. It also provides the quick killing agent for any pests that might have got in.

As the two solids are now in a mass, instead of in crstals strewed all over the bottom of the box, evaporation is slower, but enough to keep the air in the box saturated with their vapor. Such a treatment will last in full activity six months—or even longer.

THE NESTING HABITS OF EMPHOR BOMBIFORMIS CRESSON.

By Phil Rau, Kirkwood, Mo.

The striking similarity between the nesting habits of certain bees and those of certain wasps often arrests the attention of the observer. Seldom, however, is the resemblance more perfect than in the case of the mining bee, *Emphor bombiformis,* and the two species of Odynerus wasps, *O. dorsalis* and *O. geminus.* All three of these species carry water to moisten the hard earth and thus facilitate their mining and plastering activities; likewise they all strew the pellets of mud around their nests. Some of them practice the quaint and conspicuous habit of building a chimney over the opening and later moistening the chimney and using the mud thus formed for sealing the burrow. Any effort to explain just how such a precise parallelism could have developed in separate groups so distantly related and occurring in different places leads one into fascinating flights of speculation.

When one morning I saw an open burrow surrounded by a ring of clay pellets which distinctly showed the mandible marks, I was certain that it was the nest of *O. dorsalis.* I was fully surprised at finding a bee at the bottom, and so sure was I that this nest belonged to the wasp that I concluded that the bee had crept into the hole merely in quest of a night's shelter. Later evidence showed that this was the normal nest of *E. bombiformis.*

The bees live in more or less scattered colonies, in which each mother makes and maintains her own nest. Colonies of these bees were discovered in 1922 in four distinct localities near St. Louis; they were nesting at North Newstead Avenue, St. Louis, at Fish Lake, Illinois, Creve Coeur Lake, Missouri, and the southwest part of St. Louis. They were seen in the height of their activity between August 8 and September 20.

While all of the nests of this species had the same exterior appearance (Fig 1), with their chimneys and the scattered pellets, as do likewise have the completed nests with their saucer-like depressions in the mud plugs, the inside of the nests of these different groups presented some differences in shape and size.

The channel between the sealing plug and the brood cell is treated differently from those of either of the two wasps mentioned. In the nests of *O. dorsalis,* this channel is clear and free,

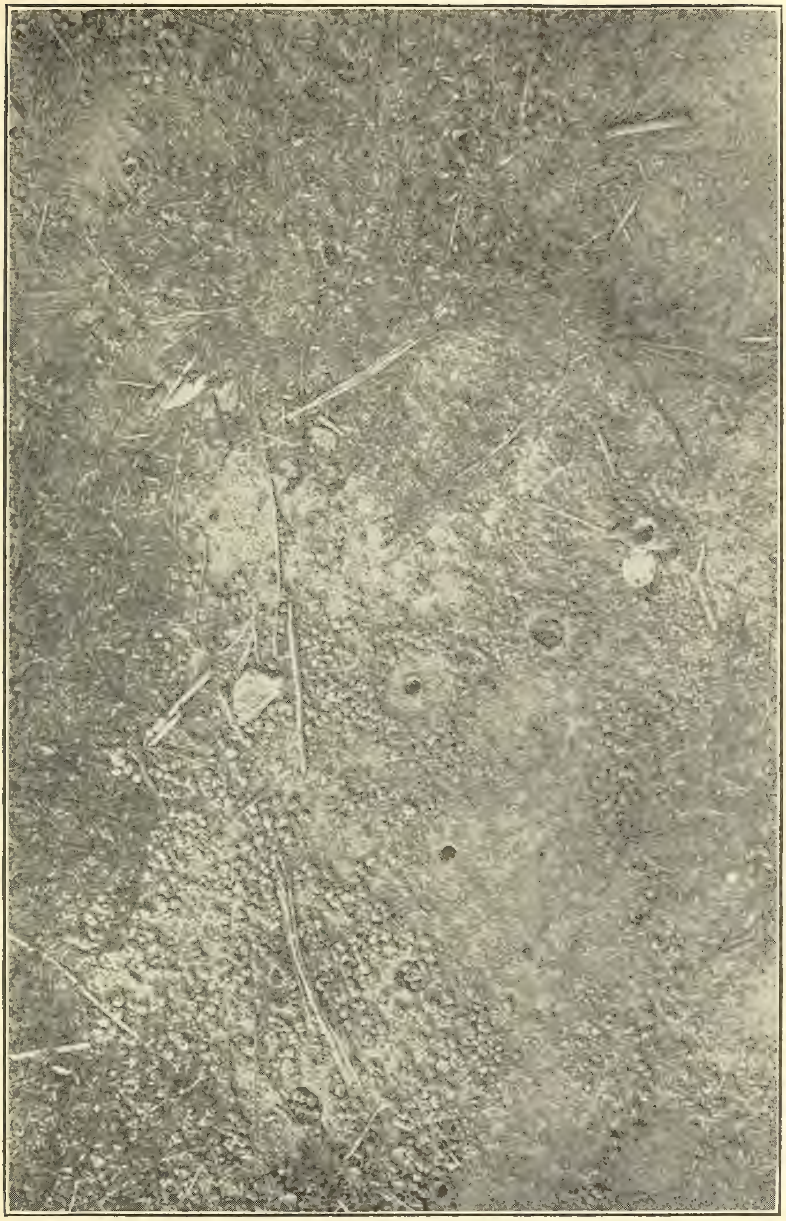

Fig. 1.—The resting site of *Emphor bombiformis.*

a sort of air chamber; in *O. geminus,* it is solidly packed with wet mud. In the nest of this bee, we find this space filled in loosely with bits of dry dirt. I had the good fortune to observe closely one mother filling the burrow and closing the top. At 11 a. m. she came home and entered the chimney head first but soon came out backwards, stopped for an instant inside the chimney, turned about and backed down into her hole until her head was level with the surface of the earth, and at a point where the chimney was attached; then after wetting it she began vigorously gnawing away the mud and carrying it down below, thereby demolishing a good portion of the chimney. With seven of these mud balls (for which she fetched water once), she completed the partition over the top cell. With this finished, she changed her technique, and with her forelegs, began to kick the loose soil near the nest into the hollow channel until the hole was full to the top. At this point she once more resorted to the use of water to mix her mortar. Moistening the earth surrounding the opening, she bit out large chunks and sealed the mouth of the burrow, using her abdomen as a trowel. In this way she made a solid plug (fig. 2) as large as a dime and smoothed down to precise saucer shape, and depressed just a little below the surface of the earth.

The turrets are low, (fig. 5) never more than one-half inch above the surface of the soil. They are made of the first mouthfuls of mud taken from the burrow. The products of further excavation are not carried out, but are kicked out in a very pretty fashion. The bee backs up to the top of the turret, and just as her hind legs reach the top, kicks out the pellet with a flip and quick as a flash the mother is down in the hole again, biting out another ball. These pellets are often shot out with such force that they travel horizontally for a distance of from three to five inches. Thus the little bee appears a quaint living shot-gun, as one after another the pellets are catapulted from the burrow. By watching closely, one may see the tip of the abdomen as the bee slowly creeps upward until it is flush with the surface; then as if ejected by a trigger the pellet is suddenly shot out, and while one's eye momentarily follows the pellet the bee quickly slides down and is out of sight. When there is no turret over the nest (nests without turrets are often seen), the pellets ejected often accumulate close to the door-way, as seen in figure 3. She then clears these away in a very practical manner, and by this method she forms the "fairy ring" of pellets as seen in center of figure 1. She proceeds by holding onto the inside rim of her burrow with her forelegs, and while she stands horizontally on her middle legs on top of the ground, she rapidly runs (while her front legs still cling to the orifice) around and around in "merry-go-round" fashion, rapidly sweeping the pellets away with the hind legs as she makes the circles. Since the strength of her kick is fairly uniform, the pellets are thrown to about the same distance; this results in the pretty fairy ring of pellets already referred to.

The mothers leave their work at intervals to fill their gullets with water. In this case their supply could not have been far away, because each trip required only from two and one-half to three and one-half minutes. The amount of water required varies according to the nature of the soil; in some places the bees could make six or seven loads of mud from one gulletful of water, and in other dry situations, only three or four.

The St. Louis bees made distinct brood cups which could be separated from the nest; those in the gumbo at Fish Lake, and those in the sandy soil at Creve Coeur Lake did not make independent cups, but merely widened the lower portion of the tunnel into a cup-shaped cell, which probably served all practical purposes. The lining wall was wonderfully smooth and glossy, as though finished with some water resisting varnish. But this cell was only the well finished burrow, and not a separate cup within the burrow. Those in the yellow clay were separate and distinct from the tunnel, and were built in true pottery fashion. This difference in the method of nesting of bees of the same species in two localities (and they were actually the same species, because specimens of both groups were submitted to Mr. S. A. Rohwer for identification), is probably due to the two kinds of soil in which they must dig. While this small detail is likely to be taken lightly as a matter of course, yet it is significant in that it shows that the bees actually can or do modify their behavior in accordance with environmental conditions.

When a bee emerges from her burrow to go for water, her manner of exit, either tail first or head first, depends upon whether she is only excavating the gallery or has nearly finished the cell; when the cell is far advanced, she has room enough to turn around and emerges head first; otherwise she must back out.

A few nests that were opened showed the following details of structure and dimensions: One nest had a total length of five inches, which comprised the cell at the bottom, the mud plug at

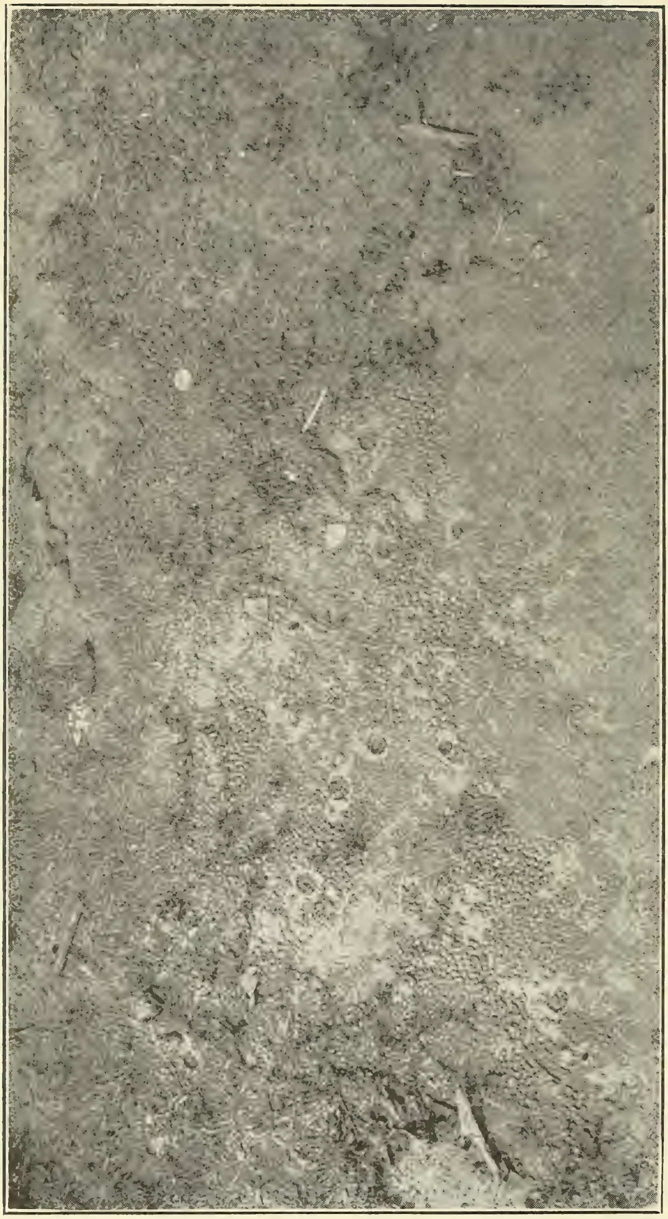

Fig. 2.—The nesting site of *Emphor bombiformis* at the end of the season; thousands of mud pellets are strewn about and wherever a chimney once stood there is now a depression.

the top of this cell, and a filling of loose dirt up to the surface plug of mud. One nest was sealed with a top plug ¼ inch thick; a 1¼ inch tunnel below this was filled with dry bits of earth, and below this were two mud plugs at intervals of ¼ and ¼ inch; these made two additional chambers and, like the first, contained loose bits of earth. Below this was the brood chamber, ¾ inch in depth. The total length of the nest was only 2¾ inches. I have no explanation to offer for the extra partitions. In one nest the mother was discovered at the bottom of the gallery 1½ inches deep; below this was a mud plug and the brood cell, filled with bee bread. Whether or not she was at work building a second cell in the gallery I do not know.

Another nest had a total depth of 3 inches; at the bottom were two cells, one above the other and marked off by mud plugs, and above these was a widening of the gallery which gave the appearance of a cell ¾ inch deep, but this contained no separate brood-cup, as did the others, but was sealed up empty with a heavy surface plug. Four other nests in a group were dug up at Fish Lake. All were about ⅜ inch in diameter, and about 2½ inches in total depth. The brood chamber at the bottom of each measured ¾ by ½ inch, and was packed full of pollen, either yellowish-green or rose-colored. These variations probably were due to the differences in soil. The St. Louis colony worked in yellow clay, the Fish Lake colony mined in a heavy gumbo soil and the Creve Coeur Lake bees nested in hard-packed sandy earth near the lake.

The greater portion of the study was devoted to the Newstead Ave. group. This colony was on a hilltop in a vacant lot, and really comprised two groups ten feet apart. Each half covered an area about three by four feet, and contained a few open burrows in the ground, with chimneys on top, a dozen holes without chimneys and about eighteen closed burrows, easily distinguishable by their saucer-like depressions (see fig. 1), and all over the place the pellets were strewn about. The pellets are always interesting because the mandible marks on each furnish a clear record of the very definite manner in which the balls of moistened earth have been manipulated by the jaws.

Not all of the pellets are scattered about, but those which are brought out first, while they are still wet and plastic, are used in making the chimney. This area of yellow clay was covered with a top layer of dark soil. Often the nests were very conspicuous by virtue of a scattering of bright yellow pellets (dug from the subsoil) on the dark gray surface.

In the heavy gumbo soil at Fish Lake, each nest was found to contain only one cell. In the clay region in St. Louis, the nests had from one to three cells each. We know that many digging bees and wasps mine a shaft and use the bottom of the tunnel for a nest; but this bee is truly a mason, as well as a digger. The plugs on top are solid pieces of mud masonry; the partitions when she has more than one cell are walls of made mud (fig. 4), and the brood cups when present are distinct and separately fashioned, and show the work of a fully qualified mason. Imbedded in the bottom of these masses of bee bread was the egg, as though it had been deposited first and the food packed on top of it. The eggs were white, and about ¼ by 1/32 inch in size.

Grossbeck[1] has made notes on this species found in New Jersey. He found them nesting in colonies near a cattail marsh, and says they seem to prefer hard, shaly soil in which to nest. He also saw the bees forcibly kick the pellets over the brim of the turrets, sometimes as far as four inches. The New Jersey *E. bombiformis* probably make but one cell to the nest, for while Grossbeck mentions nothing about the number of cells, his figures show but one.

Some observations on the nesting habits of a species closely akin to *E. bombiformis* were published by M. Louise Nichols.[2] This bee, *E. fuscojubatus,* was discovered nesting in a mixture of sand, clay and pebbles; it builds turrets, carries water, jerks out the pellets with considerable force, tears down the turret and uses the material for filling in and closing the nest, and finishes the nest with a circular depression to mark the site. Thus the nesting habits of this species observed at Cape May, New Jersey, differ in no wise from what has been recorded for *E. bombiformis* by either Grossbeck or myself, and since *fuscojubatus* is so nearly related to *bombiformis* that the distinguishing feature is only one of color of pubescence and size of third submarginal cell,[3] it does seem that the bee is changing its taxonomy before or without changing its habits.

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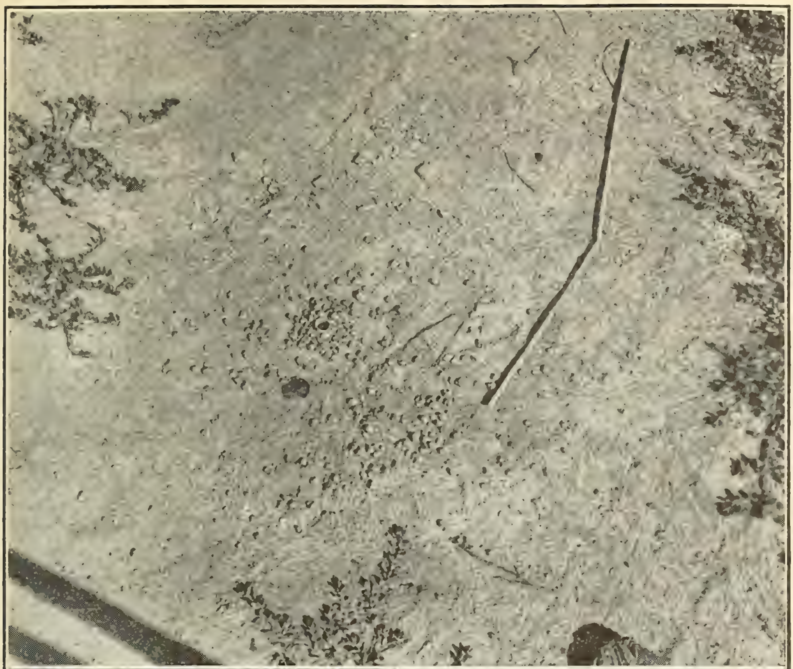
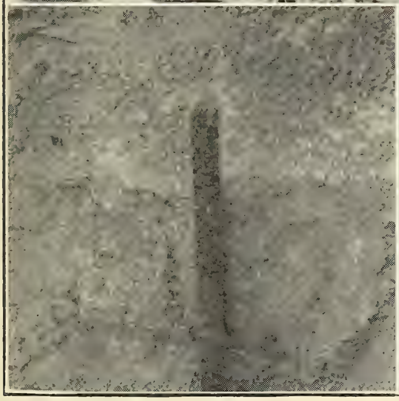
[1] Journ. N. Y. Ent. Soc. 19: 283–244. 1911.

[2] Psyche, 1913, p. 107–112.

[3] Cockerell, Psyche, 1913, p. 107.





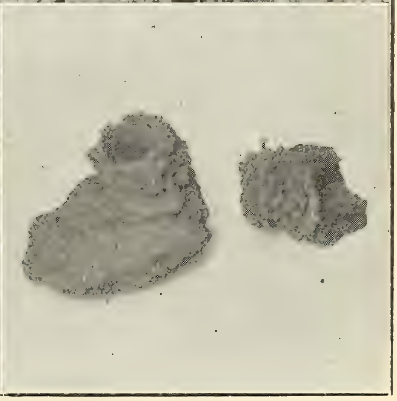


Fig. 3 (upper).—A single nest of *Emphor bombiformis* showing the accumulation of pellets about the chimney; later they are packed away.

Fig. 4 (lower left).—The mud partitions in a burrow of *Emphor bombiformis.*

Fig. 5 (lower right).—Two views of the turret over the nest of *Emphor bombiformis.*

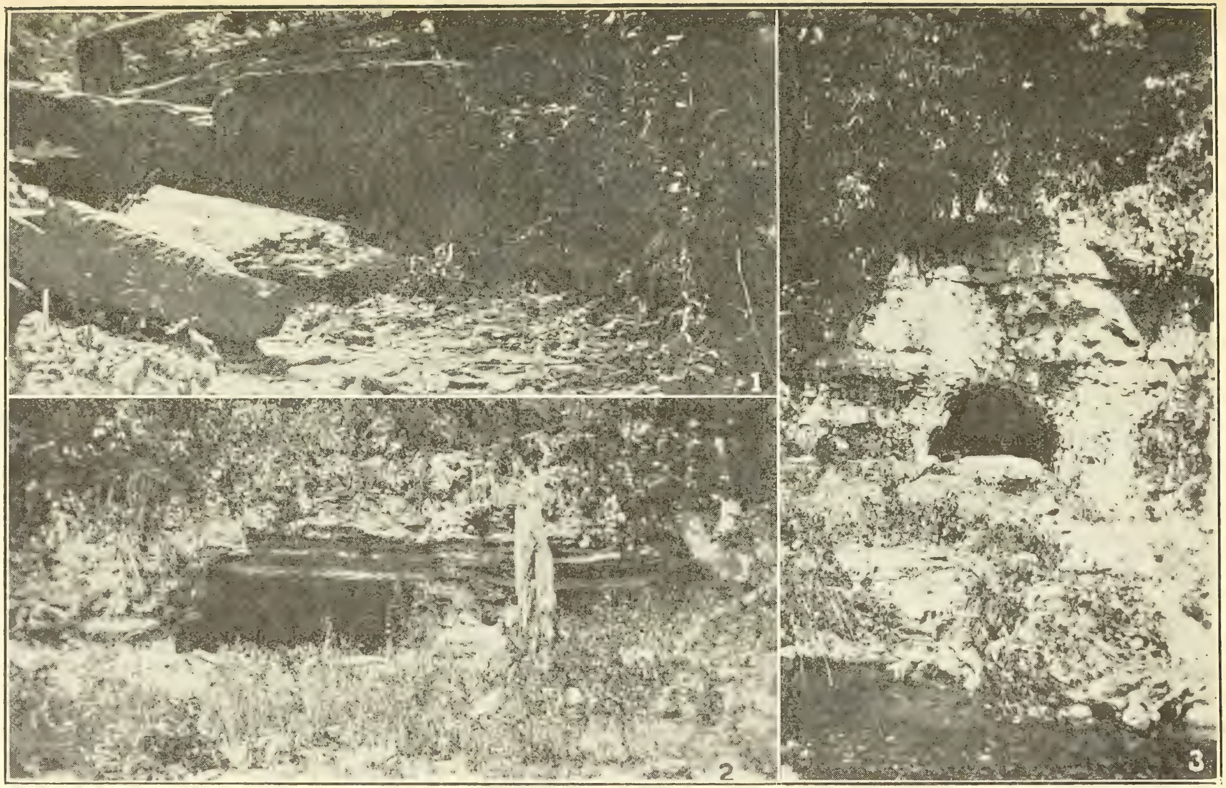
CATOCALA JUNCTURA IN THE OZARK REGION.

By Auburn E. Brower, Willard, Mo.

Of all the species of Catocalae in Eastern North America, *Catocala junctura* is in some ways the most interesting. Unlike its congeners of the East but like some forms of the West, it seeks caves, cliffs, ledges, banks, and buildings in which to pass the day, only rarely being found upon tree trunks. Its nearest relatives are all found in the Southwest or West, and Illinois seems to mark its eastward extension as the only records from east of the Mississippi River are from that state. The locality (near Willard, in Southwest Missouri) where *Catocala junctura* has been most commonly found, has an elevation of 1100–1345 feet. The rolling upland prairies of that section are now farmlands, but the broken hilly regions are largely covered with oak and hickory timber, with a great variety of trees in the bottoms.

One of the earliest of the larger species of *Catocalae, junctura* has been taken as early as June 19th (1918), and it is regularly expected by June 25. Emergence continues over a considerable period of time, fresh specimens being taken in the latter part of July. The latest record is September 14 (1919). The first specimens each summer are found about buildings. As soon as it appears, the first thing to be done upon arising is to make a round of the porches, cellar-house, and woodshed. Over the doors, sometimes upon the wire-screen of screen doors, upon the ceiling of the porches, and the stone walls of the cellar-house, they are to be found, this is especially true after a stormy night. In the woods they seek shallow caves in the rock, cliffs, ledges, banks, and trees. It is most often found upon trees in rainy weather, which fact suggests that possibly they are driven out of the higher parts of trees or elsewhere by the rain. When frightened from favored resting places, they often fly to nearby trees, and as a rule are rather easily captured with the cyanide jar. They are very rarely attracted by light, only some two or three specimens have been so taken.

Caves, buildings, and some ledges, yield most of the specimens, especially in the latter part of the season. One group of shallow caves or large holes in the rock cliff beside a spring-fed stream has always been by far the most productive locality for the species. Ranging from niches in the rocks to holes four feet high and extending inward for thirty feet, these holes in the dark gray,



No. 1. This is a view of a ledge formed by a very fine grained buffy gray sandstone. Water flows over it only during wet weather, but it is always moist beneath. Nos. 2 and 3 show two caves in the grayish, dolomitic limestone cliffs by a stream.

dolomitic limestone have always been the most desired resting places. Most of the moths are found resting in a horizontal position on the top but the position in which they orient themselves seems to be of no moment. The remarkable thing about the insect in connection with these caves is that it is found most commonly in them after the period of emergence is over. All of the insects may be captured one day and on the next none may be found but sometimes six to eight will be found especially if it is stormy weather. The caves continue to be productive for a considerable period despite the fact that the supply of moths must constantly be replenished from some unknown source.

A search of the country for miles around has not resulted in the finding of any similarly attractive caves. Twenty-five miles away, at Graydon Springs, are purplish-red sandstone cliffs whose dark weathered surface forms a fairly attractive resting place. Whether the moths in the caves represent the strays from the surrounding country or insects which have flown in from unknown distances is a mystery.

The early stages are wholly unknown. It is presumed to be a poplar and willow feeder like its nearest relatives. In this locality poplar is very rare except the scattering trees under cultivation and willow is confined to the streams, being almost wholly black willow and smaller species on the sandbars. Many females have been confined in an effort to secure eggs, but no moths have ever deposited in captivity. A significant fact has been discovered in this connection—nearly every female taken in the latter part of the season is completely devoid of eggs, apparently all have been deposited. Females of some other species of *Catocala* seem never to deposit all of their ova. It seems highly probable that the females deposit all of their eggs and afterwards roam about widely, which will account for the fact that the caves continue to be so productive. *Catocala junctura* is an interesting species in so many ways, yet little is known about it.

CHARLES JACOB MARTIN.

1835–1929.

The Brooklyn Entomological Society records with deepest regret the death of its oldest active member, Charles Jacob Martin, who was born at Alzey, Rhenish Hesse, Germany, on October 15, 1835. Mr. Martin immigrated to the United States in 1854, following with success his calling of confectioner and caterer. He served with distinction throughout the Civil War. Retiring from active work about 1900, he devoted most of his leisure to his life-long hobby—the collecting and study of insects. He became a member of the Brooklyn Entomological Society at that time. His collections, for the greater part obtained by personal field work on Long Island and in Sullivan County, N. Y., are noteworthy for the fine representation of Lepidoptera and Coleoptera, all carefully labeled with locality and dates.

Good-natured, jolly, the picture of health, Mr. Martin made friends wherever he went. Receiving and dispensing the joy of living was his particular mission. Up to recent years he attended meetings regularly, usually prepared with specimens and observations of interest. In 1928 the Society honored its patriarch by electing him an honorary member.

Proud of his citizenship and his standing as a veteran of the Grand Army, Mr. Martin's love for the Fatherland never diminshed. Twenty-six times he crossed the Atlantic to visit the old home in Alzey. While there he sickened and died on July 27, 1929. Thus to the old town in the Rhineland, which had given him birth, he returned for eternal rest.—G. P. E.

A PERSONAL NOTE.

In this number we publish the first article of a new student of the Coleoptera. We draw attention to it not alone because it adds to our knowledge of the distribution of beetles, with a number of species new to the American Fauna, but because its author, Mr. Kenneth Cooper, is still a young high school student. Our Society is glad to number him in its membership, and looks to him to be one of those to carry on its traditions in the years to come.—J. R. T. B.

ADDITIONS TO THE NEW YORK STATE LIST OF INSECTS. THE OXYBELINE WASPS (SPHECIDAE, HYMEN.).

By V. S. L. Pate, Ithaca, N. Y.

In going over material of this group preparatory to monographing the forms known to occur in the New World, a number of unrecorded species and localities not included in the recent New York State List of Insects has come to hand. These wasps, usually found upon umbellifers or composites, nest in the sand and provision their burrows with muscoid flies. They are frequently parasitized by various species of Miltogrammine flies. Wherever data relative to prey, parasites or flower records have been available they have been incorporated in the following list.

I am greatly indebted to Drs. O. A. Johannsen and J. M. Aldrich for identification of the flies.

Tribe OXYBELINI.

Oxybelus Latreille.

O. emarginatus Say. Ithaca, Jl 10–Sep 16, *Rand*; Orient, Aug 19, *Zab* (AMNH); Mosholu, Aug 30 (AMNH); Little France, Aug 19 (*Pate*-CU); Spring Lake, Jl 22, *Beq*; White Plains, Aug 20, *Beq*; **S I**, Aug 3, *Beq*; **L I**: Long Beach, Je 20, *Beq*; Cold Spring Harbor, Jl 20 (AMNH); Gardiners I., Aug 17–23, *Beq*. Taken on flowers of *Daucus carota* and *Aegopodium podagraria.* Provisions its nest with *Toxomerus geminatus* Say.

O. intermedius Baker. Ithaca, Jl 29, *Babiy*; Fishers I. Aug. (AMNH). Taken on flowers of *Daucus carota.*

O. niger Robtn. Ithaca, Jl 24–27, *Babiy*; Memphis, Jl 3 (CU); **S I**, Jl 23, *Beq*. Taken on flowers of *Daucus carota.*

O. quadrinotatus Say. Ithaca, Je–Oct, *Babiy*; Memphis, Jl 3 (CU); Rhinebeck, Jl 27, *Cy*; White Plains, Jl 20, *Beq*; Potsdam, Jl 11 (CU); Wilmington, Aug 20 (CU); Michigan Swamp, Jl 11 (CU); Spencer Lake, Je 30 (CU); **S I**, May 15–Sep 21, *Beq*; **L I**: Gardiners I., Aug. 17–23, *Beq*. Taken on flowers of *Daucus carota, Aegopodium podagraria, Achillea millefolium* and *A. millefolium* var. *roseum.* Provisions its nest with *Musca domestica.* Parasitized by *Phrosinella fulvicornis* (Coq.). The commonest species of the genus throughout the Austral and especially the Transition zone, reaching northward into Canada.

O. sericeus Robtn. **L I:** Long Beach, Je 20, *Beq*; Sea Cliff, Jl, *Bks;* Gardiners I., Aug 17–23, *Beq*. Provisions its nest with *Chaetopsis aenea* Wied.

O. subulatus Robtn. **L I:** Cold Spring Harbor, Je 14, *Beq*.

Banks has captured *O. quadrinotatus* at Falls Church, Virginia, preying upon *Musca domestica* L., *Ophyra leucostoma* Wied., and *Sarcophaga* sp.; Parker, at Washington, has also noticed that *Musca domestica* is stored by this wasp, while Sladen, at Ottawa, Canada, has found *Hylemyia cilicrura* Rond. in their burrows. At Washington, Parker has found *Senotainia trilineata* VdW., and *S. rubriventris* Macq., parasitic upon *O. quadrinotatus.* Since all these flies occur in New York it is not unlikely that upon further observation and investigation they may be discovered in the wasp's burrows either as prey or parasites.

Cis frosti Dury.—A series of 15 or more specimens were taken in a rotten fungus (*Polyporus betulinus*) at Portaupique, N. S. on July 25, 1929. These were submitted to Mr. Charles Dury who made comparisons with the unique type, which he stated was from Orono, Me., and not from Mass. as given in the Leng list. Specimens from this series will be distributed to different museums in this country and Canada.—C. A. Frost, Framingham, Mass.

Ludius fulvipes Bland.—Some 15 years ago I sent a box of specimens to Dr. Schwarz at the U. S. National Museum for names; I was then very ignorant of the amount of such work with which he had to contend. They were recently returned with part of the material labelled by the hand of the good coleopterist. In this lot I found a specimen of the above species which I had taken in Sherborn on *Amelanchier* flowers on May 3, 1913. It was described from Virginia. Specimens have been taken at Nahant, Mass., on May 19, 1926, by my friend Mr. P. J. Darlington, Jr. It is certainly not a very common visitor to my hunting grounds in this vicinity.—C. A. Frost, Framingham, Mass.

A NEW MOTH FROM SIAM.

By T. D. A. Cockerell, Boulder, Colo.

Among the numerous insects sent by Mrs. Laura McKean from the vicinity of Chiengmai, Siam, is a moth of unusual beauty, allied to a Chinese species, but quite distinct.

Daseochaeta mckeanae n. sp.

> ♀. Expanse about 33 mm.; general characters as usual in the genus (Warren says, abdomen without crests, but there are small crests, as figured by Hampson for the genotype); front and occiput with pale yellowish scales, vertex with yellowish green; the rough vestiture of thorax above pale yellowish green, flecked with yellowish; abdomen mainly pale yellowish, the dorsal crests light green, tipped posteriorly with white; a black band across the whitish caudal tuft; primaries broad (apical margin about 7.5 mm.), pale green mottled with whitish; basal part of costa pale yellowish, interrupted by a double black subbasal band, and about 1.7 mm. beyond by a black spot, the first of five evenly spaced along the costa before the broad subterminal band; the branches of the subbasal band uniting, the oblique downward extension meets a brown patch which is joined above by a black one beyond (above) which is a small black spot, the whole narrowly margined outwardly with white; if the outer part of this more or less V-like pattern were continuous above, it would join the first of the five costal spots cited above; the second of the five costal spots has below it two small black spots, and the third is continuous with a large dusky shade extending downward, and then outward to the margin of the reniform stigma, which is outlined in pure white; below the dusky shade is a small spot, and both it and the lower part of the shade are bordered on the inner side by white; below the reniform is a black spot; the subterminal band is broad, nearly as in *D. marmorea* Leech, fuliginous, shaded with black and green, irregularly bordered with white scales, ending abruptly before the lower margin, except for a small band from the outer corner; fringes with black spots at intervals; hind wings yellowish, with a broad dusky apical suffusion, and a dark spot on the fringe near the outer angle; tibiae on outer side banded with green and black.

Doi Sutep, Siam, April, 1929 (*Mrs. L. McKean*). This beautiful species appears to be nearest to the Chinese *D. marmorea*

Leech, but distinguished especially by the broad white outline of the reniform stigma. It is also a smaller insect.

Warren in 1907 established the genus *Daseochaeta* for *Agriopis viridis* Leech, a Japanese species, occurring at Yokohama. At the same time, he proposed a genus *Diphtherocoma* for *Diphtera*[1] *pallida* Moore, found from China to the Himalayas. These insects are closely allied, *D. viridis* differing by the male antennae being bipectinate with long branches almost to the apex. Hampson (1909) united Warren's genera under *Daseochaeta,* describing fourteen species, and including the well-known European *alpium* Osbeck (*orion* Esper), known to British entomologists as *Diphthera orion,* "The scarce marvel-du-jour." This beautiful species occurs in the New Forest, and other parts of the south of England, and ranges eastward to the Ussuri district in Siberia, Japan and China. The genus as limited and defined by Hampson appears to be a very compact and easily recognizable group, unlike anything else, and remarkable for the delicate shades of green and irregular dark markings on the anterior wings. The range is right across the Palaearctic region, southward into the Oriental region as far as Formosa (*D. pulchra* Wileman) and Madras (*D. muscosa* Hampson), and in the Ethiopian region to the Transvaal (*D. verbenata* Distant) and Madagascar (*D. malgassica* Kenrick), while one species (*D. beryllodes* Turner) occurs in Queensland. Species may be expected to occur in central Africa and the Malay Archipelago.

The genus is new to Siam.

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[1] *Diphtera* was the original spelling (1816); altered later to *Diphthera,* which was regarded as more correct. Warren placed *D. alpium* in this genus, which would then take precedence over *Daseochaeta;* but Hampson takes as the type of *Diphthera* the rather similarly marked though very different *Agriopis aprilina* (Linnaeus). Tutt placed *aprilina* in the genus *Dichonia* Hb., and *orion* (*alpium*) in *Moma* Hb.

TWO NEW ALCONEURA (HOMOPTERA, CICADELLIDAE) WITH NOTES ON OTHER SPECIES.

By Paul B. Lawson, Lawrence, Kans.[1]

There seems to be some doubt whether the members of this group should be placed in a distinct genus, as was done by Ball and DeLong, or whether they simply constitute a subgenus of *Dikraneura*. The writer is inclined to feel that they make up a quite definite genus for not only does the wing venation appear to be quite characteristic and constant, but in all the known species there is also a very definite black spot in either the third or fourth apical cell of the elytra.

Alconeura fulminea n. sp. (Figs. 1–4.)

A beautiful green and brown species, perhaps allied to *A. planata* more closely than to anything else in the genus. Length 2.25–2.5 mm.

Form: Head as wide as pronotum. Vertex about as wide as long, scarcely twice as long at middle as next the eye, anterior margin obtusely angulate. Pronotum a little longer than vertex, twice as wide as long, lateral margins fairly long, posterior margin shallowly concave. Scutellum moderately large. Elytra distinctly exceeding pygofer; first and second apical cells short, third decidedly longer, fourth longest. Second closed submarginal cell of hind wing fully as long as first.

Genitalia: Last ventral segment of female long, posterior margin strongly produced medially. Last ventral segment of male large; valve small, posterior margin practically straight; plates tapering to acute apices when viewed ventrally, but when viewed laterally ending in blunt upturned apices which distinctly exceed the pygofer.

Color: Vertex, pronotum and scutellum rich golden brown. Vertex with narrow brown submarginal line and broad white marginal band which extends backward across eyes, sides of pronotum, and along length of claval suture. Elytra olive green with distinct black spot in fourth apical cell opposite third cross vein. Underside for the most part greenish yellow. Abdomen sometimes largely fuscous.

Described from a male and female, holotype and allotype respectively, taken in Cameron County, Texas, August 3, 1928, by

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[1] Contribution from the Department of Entomology, University of Kansas.

Dr. R. H. Beamer. A female and two male paratypes bear the same data.

Types deposited in Snow Entomological Collection.

Alconeura quadrimaculata n. sp. (Figs. 5–8.)

A milky-white species, allied to *A. unipuncta* but recognized by the four bright orange-red spots on clavus. Length 2.75–3 mm.

Form: Head as wide as pronotum. Vertex about as wide as long, one-half longer at middle than next the eye, anterior margin broadly rounded. Pronotum distinctly longer than vertex, scarcely twice as wide as long, lateral margins long, posterior margin very shallowly concave. Scutellum moderately large. Elytra greatly exceeding abdomen; first two apical cells quite short, third and fourth subequal. Second closed submarginal cell of hind wing triangular and nearly as long as first submarginal cell.

Genitalia: Last ventral segment of female quite long, posterior margin sinuately produced to large pointed median lobe. Last ventral segment of male very large, posterior margin slightly emarginate, showing none or but little of the valve; plates, when viewed laterally, with rather large upturned apices which exceed the pygofer.

Color: Vertex, pronotum and scutellum milky white, with traces of four yellow or orange-red lines on pronotum and hints of color in basal angles of scutellum. Elytra with two bright, well-separated, orange-red spots on each clavus, a yellow line between first and second sectors and sometimes a suggestion of yellow laterad of this near the costal margin; some of apical veins margined with fuscous, particularly along costal margin; a small but distinct black spot near middle of third apical vein. Underside pale except for black tarsal claws and tip of ovipositor.

Described from a female and a male, holotype and allotype respectively, and a series of paratypes taken in Pima County, Arizona, July 27, 1927, by Dr. R. H. Beamer. A single paratype is at hand also from Gila County, Arizona, taken by Dr. Beamer, August 6, 1927.

Types deposited in Snow Entomological Collection.

Alconeura unipuncta (Gillette).

A large series of this species is at hand from Gila County, Arizona, and a specimen from the San Jacinto Mountains, California.

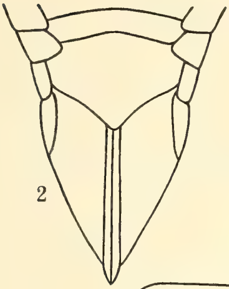
Var. *dorsalis.* A specimen of this variety from the Huachuca Mountains, Arizona, shows its very close relationship with the typical form. The writer cannot find the differences in genitalia which McAtee describes and which led him to raise it to specific rank. While the color markings are strikingly distinct, as described by DeLong, it seems, nevertheless, to be clearly a darker variety of the typical species described by Gillette.

Alconeura rotundata Ball & DeLong.

In addition to a specimen taken in Douglas County, Kansas, the writer has before him a series of specimens of this species from the Huachuca Mountains, Arizona, and from the San Jacinto Mountains, California. All these specimens agree with the description of the species as given by Ball & DeLong, except that the black spot on the elytra is situated on the third apical vein instead of in the inner angle of the fourth apical cell.

Addicted to Strong-Waters.—It may be of interest to record the capture of my third specimen of *Agabus erythropterus* Say in this locality in the outlet of a drain from the cattle barn of a large dairy in Acton, Mass., on October 20, 1929. This small trickling stream was highly impregnated with cattle urine and manure seepage. It is probably only a coincidence that four specimens of this species were taken in Penobsquis, N. B., on July 20, 1929, by treading about in a springy, muddy area on the bank of a brook which is here sunk 10 or 12 feet in a gully below the rest of the pasture land. This place was kept saturated by springs from the higher land and was covered with enlarged cattle tracks filled with water and there were more or less droppings scattered about.

At Acton a number of *Cercyon quisquilius* L. were taken flying about the dairy drain in late afternoon and many *Sphaeridium bipustulatum* Fabr. were found beneath the wet debris along it.—C. A. Frost, Framingham, Mass.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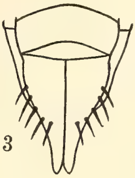
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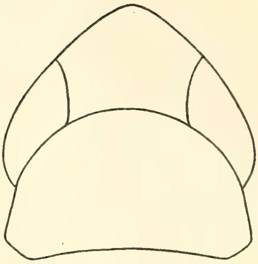
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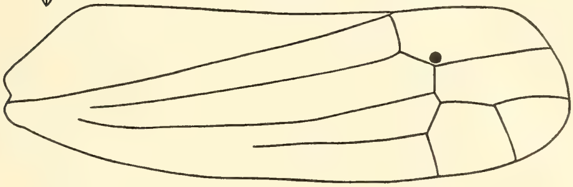
A. fulminea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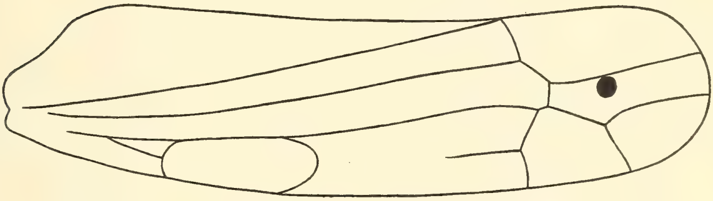
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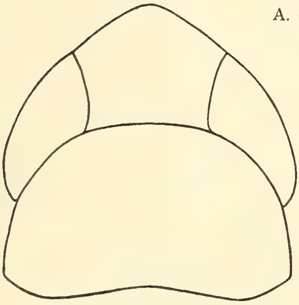
A. quadrimaculata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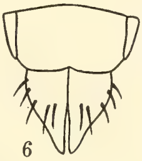
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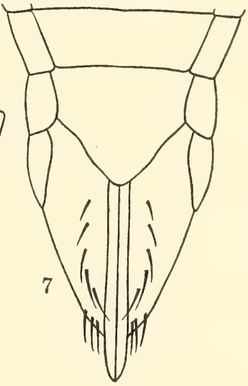
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NOTES ON ANCYLOXYPHA NITEDULA BURMEISTER.

By E. L. Bell, Flushing, N. Y.

This small Argentine *Ancyloxypha,* of which the writer has a number of specimens, collected at Córdova, by Mr. Eugenio Giacomelli, of La Rioja, Argentine, seems to have been omitted from recent works dealing generally with the American *Hesperiidae.*

It was first described by Burmeister, Descrip. phys. de la Rep. Argentina, vol. 5, p. 247, 1878, as *Thymelicus premnas* Wallengren, through his misidentification of that species, and in his description is included the statement that it is "*nitedula* Berg in litteris." Later, in the Atlas Section of the same work, pp. 55–56, 1880, he admits his error in identification of *premnas* Wallengren and states that the species he described as *premnas* and the true *premnas* of Wallengren are distinct and not even congeneric, and to avoid the use of two like names, proposes Berg's name *nitedula* for the species. This course seems quite proper and justified, for in using either name it must be accredited to Burmeister, and there can be little point in applying the name *premnas* to the species, particularly as its original use was through error.

Berg, in Anales del Museo Nacional de Buenos Aires, Tomo V, p. 253, 1896–1897, mentions the species as "*Ancyloxypha nitedula* (Burm.) Berg." and places as synonym *tucumanus* Plotz. Plotz described *Thymelicus tucumanus,* from Córdova, in Stett. Ent. Zeit., p. 284, 1884, and figured it in his Hesperid plates, number 1503. Godman, in Annals and Magazine of Natural History, vol. XX, 1907, p. 153, correctly refers *tucumanus* to the genus *Ancyloxypha* with the statement that it probably equals the female of *arene* Edwards, however, an examination of the male genitalia proves that *nitedula* and *arene* are quite distinct.

Thymelicus tucumanus Plotz must not be confused with *Nisoniades tucumanus* Plotz, described in Jahrb. d. Nass. Ver. f. Nat., XXXVII, p. 37, 1884, and also from Córdova, and figure number 1568 of his Hesperid plates; Godman, in the paper above referred to, p. 154, says "Belongs to *Staphylus* or *Bolla.* Male has a costal fold."

In size *nitedula* averages somewhat smaller than *arene* Edwards, the veins, on the upperside of both wings, are dark, either entirely or on the outer half, beneath, the upper half of the primaries is fulvous with dark veins, the lower half, black which does not quite reach the outer margin except at the anal angle, this black area is more extensive than that of *arene;* the secondaries are fulvous. The male genitalia differs from that of *arene* in that the valvae terminate in a rather slender, upcurved arm with a pointed tip.

NOTE ON THE VALIDITY OF CORIXA GEOFFROY (1762) (HEMIP. CORIXIDAE).[1]

By G. Stuart Walley, Ottawa, Ont.

The contention of Schumacher (Deutsch. Ent. Zeit., 337, 1924) that *Sigara* Fabr. (1775) obtains precedence over *Corixa* Geoff. because the latter name was not validated in the original diagnosis (Hist. Abreg. des Ins., 1, 447, 1762) but only in the year 1785 (in Fourcroy, Ent. Paris, I, 221) is based on the premises that Geoffroy did not employ binary nomenclature in the 1762 instance. The facts involved are these—

Geoffroy (1762) erected the genus *Corixa* giving diagnostic characters and below the generic description he appends the description of a single species to which must be applied the name *striata* L. by virtue of the inclusion of the citation "*Linn. Syst. nat. edit.* 10, *p.* 439, *n.* 2. Notonecta striata," in the bibliography immediately preceding the description. His procedure is almost paralleled by present day nomenclatorial practise; and that he recognized two distinct categories, genera and species, is clearly indicated when following the generic description he remarks "Nous ne connoissons qu'une seule espéce de ce genre. . . ." In this instance he was most certainly "binary" if not strictly "binomial." The application of Articles 2 and 25 of the "International Rules" clearly validate the generic name *Corixa* Geoff., 1762. Since only one species is mentioned the genotype becomes *C. striata* = *Notonecta striata* L. *Sigara* Fabr. (Syst. Ent., 691, 1775) a monobasic genus with the same genotype (*i.e., S. striata* = *Notonecta striata* L.) remains a synonym.

A comparable case is found in Opinion 20 rendered by the International Commission, in which the validity of Gronow's genera is established.

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[1] Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

BOOK NOTES.

The Problems of Applied Entomology, by Robert A. Wardle, M. Sc. Pp. i–xii + 1–587, 1 plate and 31 figs. (McGraw-Hill Book Co., New York, 1929. $5.)

Once in a while an entomological work appears which is a true compendium of some branch of the science. Such is Wardle's *Problems.* His modest title would lead one to believe that it merely posits the problems and envisages them. But he does far more than that: he studies into the proposed solutions and sets forth the best modern practice. Of course, in view of the vastness of the subject, the matter is compressed to the last degree; and so, it does not have the easy-reading quality of the much-words-about-nothing school of readily read popularizers. Nevertheless, it is full of facts, with adequate references. Anyone who needs to know the minute details can from this book readily refer to the sources.

The work is divided into three parts, containing twenty chapters and three sections. Part I treats of General Problems; Part II of Area Problems; and Part III contains the 43-page Bibliography, and the Indices by author and subject. The ten chapters (1–10) in Part I cover host resistance, climatic resistance, tropic behavior, disease, parasites and predators, theory of insecticides, stomach poisons, contact insecticides, fumigants and combination insecticides, and cultural influence. In Part II, the chapters (11–20) take up each a definite area, largely on a climatological basis. These areas are divided into South Eastern Asia, Mediterranean area, West Africa and Central America, North Western Europe, Euro-Asiatic Plains, North America (this chapter excludes Mexico, even though it is a part of continental North America, and allied in its general problems with our Southwestern States, and considers it later with that geographical expression, Central America); South America, South Africa, Central and East Africa, Hawaii and Australasia. The two concluding chapters generalize on locality disinfection and locality protection, for smaller units with what might be termed unified problems.

We may take as an example of the thoroughness of treatment of the matters in this book, Chapter 6, The Theory of Insecticides. The thought behind the entire chapter is "that it becomes increasingly evident that the economic entomologist should possess as an important part of his professional equipment a fairly comprehensive grasp of chemical priciples, especially of those which concern colloid chemistry," which argument Dr. Wardle proceeds to elaborate for a couple of pages. From this point on he discusses the ideal insecticide, cost and complexity (including here government standards of efficiency and purity), toxicity (with abstruse mathematical formulae), miscibility, emulsions, cold mixed emulsions, adhesivity. All this is basic, but one thing is forgotten: the entomologist as visualized by Dr. Wardle should also be a toxicologist of parts. For instance, Dr. Wardle would substitute fluorides for arsenicals, but fluorides are quite as toxic to higher animals as arsenicals, which your new entomologist should know. But the fact remains that the whole subject of the preparation and reactions of insecticides stays what it always was—a chemical problem *per se,* to be solved by chemists who are *also* entomologists. My view may be wrong, but twenty-five years' service in one of the great chemical companies of the United States has shown me that only a life-time and a thorough-going acquaintance with factory and use problems and with the literature of a particular branch of chemistry, is of any great avail. Dr. Wardle proposes a counsel of perfection, because I fail to see how a harassed economic entomologist is going to partition off a good half-section of his mind to dedicate to the contemplative pursuit of *theoretic* chemistry. Nevertheless, the day of rule-of-thumb in insecticides is assuredly gone by; and I agree heartily with Dr. Wardle that the economic entomologist should know the chemistry of the materials he handles, at least in its elements. *All* economic entomologists should read this chapter attentively; and decide whether they are going to be entomologists or biological chemists.

Of course, the problem of insecticides is fundamentally biological, for what an insecticide does is to derange drastically the regularity of biological processes, to the detriment of the insect victims. But insecticides barely touch one edge of the vast field of biological control of living beings. We have abolished vertebrates by the simple process of hunting them and eating them, which is not *quite* possible with the vast hordes of insects.

Fundamentally, the economic entomologist is a biologist working in a restricted field, whose function it is to discover the weaknesses of insect pests and use them to their destruction.

But all these considerations apart, which are indeed the personal reactions of the reviewer, this work of Dr. Wardle's should be not only in the hands of every economic entomologist as a book for constant reference, but also in the laboratory of every chemist and chemical plant concerned with the manufacture of insecticides. Out of personal knowledge I may say that the second half of this antithesis needs this book, if for no other purpose than to bring home to them that chemists don't know everything.—J. R. T. B.

General Catalogue of the Hemiptera—Fascicle II—Mesoveliidae, by G. Horvath. Published by Smith College, Northampton, Mass., 1929. [Pp. 8 not numbered (title pages and Introduction)+ 1–15.]

The second Fascicle of what promises to be one day the finest general catalogue of the Hemiptera was published in December, 1929.

As might be expected in so small a family as the Mesoveliidae, the species are few, the genera only two; and the generic synonymy uncomplicated. This is doubtless due to the general neglect of the group because of the very scant collections in it and the unstriking nature of these little insects, all of which look much alike in general aspect; and indeed, until a very recent time, were scarcely distinguished from each other.

It seems hardly necessary to do more than to note this fundamental work. The generic and specific synonymies are full; and the bibliography of 129 titles is nearly complete. However, the present writer (perhaps through *amour propre*) notes the absence in the Bibliography of his extensive paper in 1925, in Spolia Zeylanica, vol. XIII, part 2, pp. 223 to 234. On page 225 of this paper an analysis is made of the characters that distinguish *Mesovelia orientalis* Kirk. from *M. mulsanti* (B. White) Dist., [=*M. bisignata* (Uhl.) Dist.], to which Distant synonymized the former in Fauna of British India, Rhynchota, vol. I, p. 169.

But be this omission as it may, this remains the first authoritative and adequate catalogue of this small family, since Lethierry and Severin in 1893. It should be made the basis for a thoroughgoing revision of the family.

Incidentally, it is to be hoped that other hemipterists may take heart of grace and clear up some of the other groups very soon. The Editorial Board, of course, is anxious to go forward as fast as possible and to complete the whole work in a relatively short time. But it cannot do this without the cooperation of all hemipterists, each doing his immediate share. A catalogue from its nature can never be a closed book—as soon as it is out changes begin to be made. It can only hold up the mirror to the expression of the moment, as it were; and let what comes after take care of itself. If cataloguers-presumptive wait till all the possible forms are described before setting forth what is known, then their Ka will have to do the job.

(N. B.—No price is given for this fascicle.)

P. S.—As we go to press we learn (officially) that the parts already published are as follows:

Fasc. I. Membracidae, by W. D. Funkhouser, 1927, 581 pp. Price $3.50. Published June 29, 1927.

Fasc. II. Mesoveliidae, by G. Horváth, 1929, [4]+15 pp. Price $0.50. Published December 4, 1929.

Fasc. III. Pyrrhocoridae, by R. F. Hussey and E. Sherman, 1929, 144 pp. Price $1.50. Published December 30, 1929.

Epiphanis cornutus Esch.—A specimen of this apparently rare beetle was taken at South Paris, Maine, on July 11, 1929, while sweeping bushes and weeds. My other two specimens were also taken in the month of July: one at Mt. Washington, N. H., by Mr. C. W. Johnson on the 28th of the month and the other at Springville, Erie Co., N. Y., on the 12th of July; collector unknown.—C. A. FROST, Framingham, Mass.

Stenus retrusus Casey.—Two female specimens of this distinctly characterized species were taken at Westchester Lake, near the Londonderry Mines in Nova Scotia, on July 26, 1929. These ran down very nicely to this name in Col. Casey's monograph of the genus though it was described from a single female specimen said to be from Vancouver Island, B. C. In the remarks it is stated that the species approaches the European *planatus* Er. and comparison might prove interesting.—C. A. FROST, Framingham, Mass.

EDITORIAL.

THE FUNCTION OF A DESCRIPTION.

A specific description is, briefly, the setting forth in words of the structural and differential characteristics that serve to separate one entity from others that resemble it, together with those that show its affinities, in order than any person without previous knowledge of the unit may be able to readily recognize it should he meet with it.

A description is certainly not a means to furnish the cabinet with types, nor an exercise in verbosity, nor a vehicle to exhibit outstanding erudition. Neither is it an introduction to cryptograms, nor an example of the art of concealing thought.

The outstanding characteristics of far too many current descriptions might appear to be a vagueness of purpose, and a hazy idea of the end to be attained.

A description has one primary purpose: to make a category *known* to those to whom it is *unknown;* to ticket it for future reference. A modern description, of course, has other purposes also, such as indicating the biological facts of the category and establishing its taxonomic position. But from the very beginning, its purpose has been to acquaint others with what the describer had under his eyes and in his mind.

Now, describers, as a class, seem unable to exteriorize themselves; and to understand that what to them, because of intense study, is obvious and elementary, is quite obscure or unapparent to another unfamiliar with the group or with its specific forms, and with the methods of work of the describer.

Descriptions range from one or two lines, such as " similis *alba,* sed nigrior, alis pedibusque rufotestaceis," to voluminous and minute examinations of the most evanescent, variable and recondite structures—in short, a word picture of a unique individual—and the more sesquipedalian the language and the less its substance, the better; or perhaps " resembles form *quinta* ab. *nasopollifer,* but primaries more suffused with melanic undertones." " Ab. *nasopollifer* " is represented by the unique type in Nome, Alaska, snow fifteen feet deep, and Rin-Tin-Tin gathered to his fathers. How is the student going to get it for comparison? And is it anything anyhow?

The three great desiderata of a good description are: clear understanding of the end to be attained, lucidity and exactness. The end to be attained is indeed the basis, but to make a description lucid the describer must have understanding and must put in everything (in moderation), not alone the things obvious to the eye, but also the things latent in his mind. His fellow-workers have not attained that nice discrimination his own intensive study has given him, and they must be told what to him is the trite detail. For, if the readers know the form itself, the description to them would be superfluous as a means to attain knowledge. The describer must not alone tell what is present; he should also point out what is absent, so long as it is a characteristic of some other form in the aggregation. Each and every description should stand by itself; that is, no other descriptions nor specimens should be required in order to understand it and apply it. Nevertheless, no description is complete without due reference to neighboring forms; and direct statements of wherein the novelty resembles and wherein it differs from its neighbors or from any other form for which it might be mistaken. All these elements make for lucidity and hence for comprehensibility.

Exactness is the third indispensable ingredient of a good description. The day of vague comparatives, such as "broad," "long," or, "longer than 2d but shorter than 4th" is past. How much easier and more exact to say "3 mm. long and 2 mm. wide"! If the general run of the group is in the proportion of 2 : 1 in length and breadth, then this of course, is broad. But an actual number is concrete and definite and leaves nothing to the imagination or judgment. It is a fact stated factually! Why say "a smaller form than the average in the group," when it may just as easily be put: "the general run of the group exceed 10 mm. in length, but this species averages less than 8 mm."?

In all this that precedes I am not overlooking the morphological or taxonomic implications of a description, because a good description must be *both* in its essence. For while its utilitarian end is the foundation of a description, morphology and taxonomy are certainly the superstructure.—J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF NOVEMBER 14, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, November 14, 1929, at 8.10 p. m.

President Davis in the chair, and ten members present, *viz.*, Messrs. Ballou, Chapin, Cooper, Engelhardt, Notman, Pollard, Schaeffer, Sheridan, Siepmann and Torre-Bueno, and three visitors.

In the absence of the secretary, Mr. Siepmann acted as secretary pro tem.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the monthly report of the treasurer, and Mr. Torre-Bueno briefly reported progress for the publication committee.

Mr. Engelhardt proposed for membership Dr. Adam Böving, U. S. National Museum, Washington, D. C., and Mr. Davis proposed Mr. Herbert E. Wilford, 1747 E. 26th St., Brooklyn, N. Y., who was present. It was regularly moved and seconded that the by-laws be suspended, and the secretary cast one ballot for their election, which was accordingly done.

Mr. Torre-Bueno reported that he received a communication from Mr. Pinney Schiffer, a member of the society, who was preparing for a trip to the Guianas. He also commented upon and exhibited a copy of the book "Flowers and Insects" by Charles Robertson, which gives tables of our various wild flowers and the species of insects recorded on each.

Mr. Notman reported that the past summer had been the best collecting season he ever experienced. He made a trip to the Rocky Mountains and California, stopping at the Adirondacks on his return. Several thousand specimens of Carabidae and other beetles were obtained.

Mr. Cooper exhibited a number of specimens of an European colydid beetle, *Bitoma crenata,* taken beneath bark at Flushing, L. I., on Nov. 9. According to Mr. Schaeffer this is a new record not only for Long Island, but for North America as well. From the number of specimens Mr. Cooper obtained it is evident that the species is well established here. The beetle is a small, elongate, black species, readily recognized by the two bright red spots on each elytron.

Mr. Engelhardt spoke of the last years in the life of Franz. G. Schaupp, also known as the father of the Brooklyn Entomological Society.

In 884 Mr. Schaupp left for Texas where he remained until his death in 1904. About the first half of his residence in Texas little is known. Happy-go-lucky by nature, he moved about more or less, easily making friends and a living by tutoring and by collecting insects. A file of letters kindly submitted by Dr. J. G. Needham, discloses that he lived at Shovel Mount, Burnett County from 1897 to 1900 and that he proved himself while there an excellent and resourceful collector and breeder of Odonata. He mentions trips to the Rio Grande, to Galveston and a three weeks vacation to Minnesota and also refers to collections made for Professor Hagen and Dr. Calvert. In substance the letters received by Dr. Needham deal with the breeding and the habits of Odonata, carefully observed and interestingly recorded by Mr. Schaupp.

Mr. Torre-Bueno spoke of the great services rendered to entomology by amateurs, and commented that although the science was tending to become a closed profession, open only to professional men, the amateur alone has the time and independence necessary for extensive collecting and the careful gathering together of entomological information. The professional and specialized entomologist will always depend upon the work of the amateur for the materials of his studies, and as long as this dependence exists, the amateur will continue to hold his place in entomology.

Mr. Schaeffer supported his statements, remarking that some of the best American coleopterists, including Dr. Le Conte and Dr. Horn were not professionals.

Mr. Davis exhibited a box of Cicadas collected by Mr. Engelhardt during the past summer in Missouri, New Mexico, and Texas.

Adjourned at 10.10 p. m.

CARL GEO. SIEPMANN
Secretary pro tem.

MEETING OF DECEMBER 12, 1929.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on December 12, 1929, at 8.10 p. m.

President Davis in the chair, and 10 members present, viz., Messrs. Anderson, Ballou, Cooper, Engelhardt, Lemmer, Schaeffer, Shoemaker, Siepmann, Torre-Bueno and Wilford.

In the absence of the secretary, Mr. Siepmann acted as secretary pro tem.

The minutes of the previous meeting were read and approved, and Mr. Engelhardt presented the monthly report of the treasurer.

Mr. Torre-Bueno reported for the publication committee, stating that the next issue of the BULLETIN would be mailed shortly after Christmas.

Mr. Davis proposed for membership Mr. Joseph F. Burke, 194 Clinton Street, Brooklyn, N. Y., and Mr. Cooper proposed Mr. Howard Black, 26 South 27th Street, Flushing, N. Y. Both Mr. Burke and Mr. Black being present, it was regularly moved and seconded that the by-laws be suspended, and that the secretary cast one ballot for their election, which was accordingly done.

Mr. Davis brought to the attention of the society the death of Mr. George Notman, the father of Howard Notman, a member of the society.

Mr. Torre-Bueno read a communication from the Zoological Society of London, concerning the *Zoological Record,* a publication giving a complete record of all the writings pertaining to the various branches of Zoology published during the calendar year.

Mr. Davis appointed Messrs. Sheridan, Shoemaker and Lemmer as a nominating committee.

Mr. Shoemaker exhibited specimens of Carabidae taken at the edge of the swamp at Piermont, N. Y., 26 miles up the Hudson. Among the interesting species obtained were *Casnonia ludoviciana, Leptotrachelus dorsalis, Rembus laticollis, Chlaenius niger, Chlaenius laticollis,* and *Oodes armericana.*

Mr. Schaeffer spoke of 165 species of Coleoptera new to Long Island or to New York, of which he exhibited specimens. A list of the species will be published in the Bulletin.

Mr. Cooper exhibited specimens of Coleoptera new to Long Island. He will continue his paper at the January meeting.

Adjourned at 10.10 p. m.

CARL GEO. SIEPMANN,
Secretary pro tem.

Vol. XXV APRIL, 1930 No. 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

THSONIAN INSTITUTION
MAY 15 1930
NATIONAL MUSEUM

NEW SERIES

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

E. L. BELL GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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ON THE GENERIC AND SUBGENERIC DIVISIONS OF THE VESPINAE (HYMENOPTERA).

By J. Bequaert, Harvard University Medical School, Boston, Mass.

The present paper is an outgrowth of a revision, which I am now preparing for publication, of the North American species of *Vespa*. When I came to consider the proper generic and subgeneric names to use for these wasps, I found that no serious attempt had been made to define or delimit the superspecific groups. To do this involved a study of as many species as possible from all over the world, for, in my opinion, genera and subgenera cannot be properly defined with only the species of a limited geographical area. On the other hand, a taxonomic discussion of the Vespinae as a whole would be out of place in a strictly faunistic paper, so that I have decided to publish it separately.

The subfamily Vespinae, as here accepted, is a group of social, monogynous wasps, which may be defined as follows (J. Bequaert, 1918, Bull. Amer. Mus. Nat. Hist., XXXIX, p. 17) : Clypeus broadly truncate at the apical margin, which is, as a rule, slightly emarginate or ends in two rounded lateral teeth. Mandibles short and broad, folded over each other beneath the anterior margin of the clypeus, with a broad, sharply toothed, apical cutting edge. Labial palpi of 4, and maxillary palpi of 6 segments. Antennae with 12 segments in female and worker; with 13 segments in the male, the apical one normal. Tarsal claws simple. Middle tibiae with two apical spurs. Wing venation of the usual diplopterous type: three closed cubital cells; both recurrent nervures received by the second cubital cell; radial cell elongate, pointed toward the apex which lies close to the costal margin; hind wings entire and narrow at the base, without anal or posterior lobe, but the preaxillary excision very deep; fore wings distinctly plaited longitudinally. Mesonotum without traces of notauli (parapsidal furrows of authors). Mesepimerum completely separated by a suture from the mesepisternum; but the mesepisternum never subdivided by a median, oblique suture into an upper and a lower plate and never with a prepectal suture. Hind margin of postscutellum produced in the middle, forming a long, triangular lobe wedged in the upper part of the propodeum. First abdominal segment subsessile, not forming a podeon; the tergite, as a rule, with a distinct edge or rounded angle between the anterior, vertical and the posterior, horizontal face. Extensory muscle of the abdomen inserted in a broad, oval valvula between the apical scales of the propodeum.

According to Bordas (1895, Ann. Sci. Nat., Zool. (7), XX, p. 165), the internal male genital organs or testes of *Vespa* each consist of numerous (200 to 350) tubular glands, whereas in all other social and solitary Diploptera they comprise each 3 or 4 tubes only. This striking difference induced H. v. Ihering (1896, Zool. Anzeiger, XIX, p. 453) to separate *Vespa* into a distinct family, equivalent to the remainder of the social wasps. But the whole morphology of *Vespa* agrees so perfectly with that of the other Diploptera, that this extreme course seems hardly correct.

The Vespinae are defined by a combination of characters, rather than by one or more peculiarities which they alone exhibit. Their most exclusive features appear to be the absence of the anal lobe and the deep preaxillary excision of the hind wing. Nevertheless, this subfamily is unusually well delimited and there are no transitions whatsoever to any of the other living Diploptera. As a distinct group it is probably very ancient geologically speaking, although we have no positive paleontological proof of this. Of course, I am well aware that a number of fossil insects have been described as primitive *Vespae,* and I shall discuss them in the appendix; but an examination of some of these fossils has convinced me that their vespine nature is too problematical to be used as a valid argument in support of the antiquity of the genus *Vespa.*

At the present time the Vespinae are almost limited in their distribution to the Holarctic and Oriental Regions. No species are indigenous in the Neotropical and Ethiopian Regions, Australia, New Zealand or Polynesia, although from time to time specimens have been recorded from those parts of the world. Where these records were based upon actual captures (and not upon wrong labelling), they were due to accidental introduction by man. In some cases such introductions have resulted in the species becoming naturalized outside its original range: thus, *V. crabro* Linnaeus has become established in the eastern United States, *V. vulgaris* Linnaeus in New Zealand, and *V. occidentalis* Cresson in the Hawaiian Islands.

Linnaeus's genus *Vespa* (1758), although the type of the subfamily, did not originally correspond to the Vespinae as defined above. Of the 17 species included, 3 have not been recognized, 3 are Sphegoidea, and 8 are now placed in *Odynerus, Eumenes* and *Polistes.* This leaves only 3 species in the Vespinae, *viz., V. crabro* (the first species listed), *V. vulgaris,* and *V. rufa.* There has been some difference of opinion as to which of these three species should be taken as the genotype of *Vespa.* Apparently the first selection was made by Lamarck in 1801 (Système des Animaux sans Vertèbres, I, p. 271), who designated *V. crabro* as the type. Latreille evidently accepted this selection in 1804 (Nouv. Dict. Hist. Nat., XXIV, p. 181) and in 1810 (Considér. Gén. Crust. Ins., pp. 330 and 438). Unfortunately in 1802 (Hist. Nat. Crust. Ins., III, p. 364), Latreille cited *V. vulgaris* as the type of *Vespa,* perhaps because he was not yet aware of Lamarck's designation of a year before. Bingham (1897) and Ashmead (1902) have followed Latreille's designation of 1802, which would make *Vespula* Thomson a synonym of *Vespa* Linnaeus, while *Macrovespa* Dalla Torre (1904) would have to be used for the group of *V. crabro.* There is, however, no need for these disturbing changes, since I am entirely in agreement with Morice and Durrant [1915, Trans. Ent. Soc. London (1914), 3–4, pp. 399–400] that Lamarck's type selection was valid and must be regarded as binding.

The first attempt at subdividing *Vespa* was made by C. G. Thomson in 1869: he restricted *Vespa,* proper, to the species with the head dilated behind the eyes; he knew only one species of this group, *viz., V. crabro* Linnaeus. With the species with short vertex and posterior orbits, Thomson formed his subgenus *Vespula,* containing *V. media* Retzius, *V. saxonica* Fabricius, *V. norwegica* Fabricius, *V. holsatica* Fabricius, *V. vulgaris* Linnaeus, *V. germanica* Fabricius, *V. austriaca* Panzer, and *V. rufa* Linnaeus; no subgenotype was selected. The first valid type designation for *Vespula* appears to have been made by Ashmead in 1902 (Canad. Entom., XXXIV, p. 164): he raised it to generic rank and selected as type *Vespa austriaca* Panzer, which automatically makes *Pseudovespa* Schmiedeknecht (1881) a synonym of *Vespula* Thomson. Ashmead's designation must be accepted, even though the characters he attributes to *Vespa* and *Vespula* are erroneous. Both *V. vulgaris* (which he gives as the type of *Vespa*) and *V. austriaca* (which he makes the type of *Vespula*) agree in having "the eyes extending to the base of the mandibles, or very nearly." Moreover, Rohwer in 1916 confirmed Ashmead's designation of *V. austriaca* as the genotype of *Vespula*. I conclude that Birula's recent (1927) designation of *V. media* Retzius as the type of *Vespula* is invalid.

In 1903, Ashmead proposed the genus *Provespa* for a species of the Oriental Region, *V. anomala* de Saussure. Dalla Torre's new name *Macrovespa* (1904) covers the group of species with the head swollen behind the eyes and corresponds to Thomson's *Vespa,* proper.

In 1916, Rohwer subdivided *Vespula* Thomson further: the species with a long oculo-malar space he segregated in a subgenus *Dolichovespula,* with *V. maculata* Linnaeus as the type, and left those with a short oculo-malar space in *Vespula,* proper (type: *V. austriaca* Panzer).[1]

I have been able to study forty-one of the described species of Vespinae. Of the twenty odd so-called "species" which I have not seen, about one-half are probably either synonyms or slight color variations. At first I was inclined to regard all these wasps as forming only one genus; but a more prolonged study has brought me to recognize three natural groups that appear sufficiently well circumscribed to deserve generic rank. My final decision has been especially influenced by zoögeographical considerations. *Provespa* is strictly Oriental; *Vespa,* proper, is distributed over the Palaearctic and Oriental Regions; while *Vespula* is Holarctic. A number of sub-groups may be defined in both *Vespa* and *Vespula,* but they seem to intergrade and, moreover, are based on rather artificial combinations of characters, so that I cannot regard them as of more than subgeneric value.

1. **Provespa** Ashmead, 1903, Entom. News, XIV, p. 182. Type by monotypy: *Vespa dorylloides* H. de Saussure, 1853 = *V. anomala* H. de Saussure, 1853.

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[1] *Paravespa* Radoszkowsky (1886), placed by Ashmead (1902) in the Vespinae, solely from the description, is one of the Eumeninae and a synonym of *Odynerus* subgenus *Rygchium* Spinola.

Head relatively small, with narrow outer orbits and very short vertex, the posterior ocelli placed near the supraorbital line of the eyes and only a little farther from the margin of the occiput than from the eyes. Inner margins of the eyes distinctly farther apart at the clypeus than on the vertex, which is unusually narrow. Outer orbits rounded off behind, not separated by a carina from the occiput. Ocelli very large and close together, the posterior ones closer to the inner orbits than to each other. Oculo-malar space very short, almost absent. Third segment of labial palpi with a strong, stiff seta on the inner side, before the apex. All tibiae with long, erect hairs on the upper face. Sides of pronotum completely rounded off anteriorly in the upper part, with a slight trace of a vertical carina in the lower part; humeral calli not separated from the sides by a carina or suture. First abdominal segment cup-shaped, the tergite bluntly rounded off between the horizontal, posterior and vertical, anterior face. Basal vein reaching the subcosta close to the stigma (the distance about equal to the length of the stigma, or a little more); first cubital cell very long, as long as the distance of its apex to the tip of the wing; second and third cubital cells short and high; apex of first discoidal cell vertically truncate, the second section of the cubitus forming a straight line with the first intercubitus; stigma large. Hamuli (or hooklets) of hind wing beginning close to the tip of the subcostella.

This genus contains only two species of the Oriental Region: *P. anomala* (H. de Saussure) (Syn.: *Vespa dorylloides* H. de Saussure), of Sikkim, Burma, Tenasserim, Malacca, Java, Sumatra, Borneo, and the Philippines (?); and *P. barthelemyi* (R. du Buysson), of Bhutan, Burma, Siam, Cambodia, and Cochinchina. Both species, of which I have seen specimens, are strictly nocturnal.

The nearest approach to the enlarged ocelli of *Provespa* is found in *Vespa binghami* R. du Buysson, of Tenasserim and Yunnan. In a female of *V. binghami,* from near Shanghai, kindly given to me by Father Octave Piel, the ocelli are decidedly larger than usual and slightly closer to the inner orbits than to each other; in addition, the inner margins of the eyes are decidedly closer on the vertex than at the clypeus. In all other characters, however, this species is a typical *Vespa,* proper. I suspect, from the pale brownish, slender appearance and the swollen ocelli, that *V. binghami* also is a nocturnal or crepuscular wasp.

2. **Vespa** Linnaeus, 1758, 'Syst. Nat.', 10th Ed., I, pp. 343 and 572. C. G. Thomson, 1869, 'Opuscula Entom.', I, p. 79; 1874, 'Skandinaviens Hymenoptera', III, 1, *Vespa* Lin., p. 8. Birula, 1925, Arch. f. Naturgesch., XC (1924), Abt. A, Heft 12, pp. 88 and 89. Type by designation of Lamarck (1801): *Vespa crabro* Linnaeus, 1758.

Macrovespa Dalla Torre, 1904, 'Gen. Insect., Vespidae,' p. 64. Type by present designation: *Vespa crabro* Linnaeus, 1758.

Vespa, groupe des Frelons, R. du Buysson, 1905, Ann. Soc. Ent. France, LXXIII, 3 (1904), pp. 487 and 501.

> Head very large, swollen behind the eyes, with very wide outer orbits and long vertex; posterior ocelli placed close to the middle of the upper lobes of the eyes and 3 to 6 times as far from the occipital margin as from the eyes. Outer orbits separated from the occiput by a carina, which, however, does not run behind the vertex. Ocelli as a rule small, exceptionally somewhat swollen, the posterior ones usually closer to each other than to the eyes. Oculo-malar space either long or short. Third segment of labial palpi (at least in the female and worker) with one or two strong, stiff setae on the inner side, before the apex. All tibiae with long, erect hairs on the upper face. Sides of pronotum with a vertical carina, running over the entire upper portion; humeral calli separated from the sides of the pronotum by a suture or carina. First abdominal segment truncate anteriorly, the tergite more or less angular between the horizontal, posterior and the vertical, anterior face. Basal vein reaching the subcosta very far from the stigma, the distance nearly three times the length of the stigma and twice or more the length of the last section of the basal vein; first cubital cell shorter than the distance between its apex and the tip of the wing; second cubital cell broad; the third high and narrow; apex of first discoidal cell oblique, the second section of the cubitus forming an angle with the first intercubitus; stigma small, often inconspicuous. Hamuli of hind wing beginning before the tip of the subcostella.

Vespa, as here delimited, is restricted to the Palaearctic and Oriental Regions (including Malaysia as far as New Guinea). One species was introduced into the Nearctic Region, some 75 years ago. The several species exhibit many, rather striking differences in structure, on the strength of which it is possible to arrange them into a number of groups as indicated below. If one studies only a few of the extreme types, he might readily be tempted to apply subgeneric names to these groups, and I do not doubt that some entomologist will promptly rush in and do so. In my opinion, however, these groups are highly artificial and not of subgeneric value.

I have examined specimens of the following species:

Group 1. Clypeus (of female and worker) with a small, more or less distinct tooth in the middle of the apical emargination. Oculo-malar space short but distinct. Ocelli small, the posterior ones much closer to each other than to the eyes. In the male (which I have not seen), the median tooth of the clypeus is said to be either indistinct or replaced by a slight median carina running halfway up the clypeus. *V. analis* Fabricius, *V. parallela* André, and *V. nigrans* R. du Buysson.

Group 2. Clypeus without median tooth in the apical emargination. Oculo-malar space very short. Ocelli distinctly swollen, the posterior ones a little nearer the eyes than to each other. *V. binghami* R. du Buysson.

Group 3. Clypeus without median tooth in the apical emargination. Oculo-malar space long, in the female and worker about the length of the penultimate antennal segment or longer. Ocelli small, the posterior ones much closer to each other than to the eyes. *V. tropica* Linnaeus (= *V. cincta* Fabricius and its var. *affinis* Fabricius), *V. deusta* Lepeletier, *V. basalis* F. Smith, *V. magnifica* F. Smith, *V. ducalis* F. Smith, and *V. mandarinia* F. Smith.

Group 4. Clypeus and ocelli as in Group 3. Oculo-malar space short, in the female and worker shorter than the penultimate antennal segment. *V. crabro* Linnaeus, *V. orientalis* Linnaeus, *V. mongolica* André, *V. bicolor* Fabricius, *V. fervida* F. Smith, *V. velutina* Lepeletier, *V. auraria* F. Smith, *V. bellicosa* H. de Saussure, *V. luctuosa* H. de Saussure, and *V. oberthuri* R. du Buysson.

In the genus *Vespa* the relative length of the oculo-malar space shows a gradual passage from the extreme case of *V. mandarinia,* where it is much longer than the penultimate antennal segment, to that of *V. bellicosa,* where the eyes nearly touch the base of the mandibles. The condition in *V. crabro* is just about midway and that species could be placed equally well in Group 3. Moreover, the oculo-malar space varies within the same species and is usually longer in the female and male than in the worker.

The following species, which I have not seen, also belong in the genus *Vespa,* as here restricted: *V. dybowskii* André, *V. eulemoides* R. du Buysson, *V. indosinensis* J. Pérez (1910, Actes Soc. Linn. Bordeaux, LXIV, p. 8.—Oriental Region), *V. micado* P. Cameron, *V. mocsaryana* R. du Buysson, *V. multimaculata* J. Pérez (1910, *loc. cit.,* p. 14.—Java), *V. nigripennis* H. de Saussure, *V. philippinensis* H. de Saussure, *V. rubricans* J. Pérez (1910, *loc. cit.,* p. 10.—Supposedly from East Africa; probably based upon introduced specimens of *V. tropica*), *V. suprunenkoi* Birula [1925, Arch. f. Naturgesch., XC (1924), Abt. A, Heft 12, p. 89.—Sakhalin and Korea], *V. tyrannica* F. Smith, *V. unicolor* F. Smith, *V. variabilis* R. du Buysson, and *V. wilemani* Meade-Waldo [1911, Ann. Mag. Nat. Hist. (8), VII, p. 104.—Formosa].

3. **Vespula** C. G. Thomson. Ashmead, 1902, Canad. Entom., XXXIV, p. 164. Rohwer, 1916, 'The Hymenoptera, or Wasp-like Insects, of Connecticut', p. 642.

Vespa subgenus *Vespula* C. G. Thomson, 1869, 'Opuscula Entom.,' I, p. 79; 1874, 'Skandinaviens Hymenoptera,' III, 1, *Vespa* Lin., p. 10. Type by designation of Ashmead (1902): *Vespa austriaca* Panzer, 1799.

Pseudovespa Schmiedeknecht, 1881, Entom. Nachrichten, VII, pp. 314, 317 and 318. Monotypic for *Vespa austriaca* Panzer, 1799.

Head of moderate size, not swollen behind the eyes, with the outer orbits of normal width and the vertex short; posterior ocelli placed close to or tangent with the supraorbital line and at most as far from the occipital margin as from the eyes (usually closer to the occipital margin). Outer orbits with or without carina separating them from the occiput. Ocelli small, the posterior ocelli closer to each other than to the eyes. Oculo-malar space either long or short. Third segment of labial palpi without a strong, stiff seta, sometimes with a small hair. Tibiae with or without long hairs on the upper face. Vertical carina on the sides of the pronotum either complete, or indicated in the lower portion only, or obsolete; humeral calli not separated from the sides of the pronotum. First abdominal segment truncate anteriorly, the tergite more or less angular between the horizontal, posterior and the vertical, anterior face. Distance between tip of basal vein and stigma less than twice the length of the stigma and about equal to the last section of the basal vein; first cubital cell shorter than the distance between its apex and the tip of the wing; second cubital cell broad; the third high and nar-

> row; apex of the first discoidal cell vertically truncate or slightly oblique, the second section of the cubitus hardly forming an angle with the first intercubitus; stigma well-developed. Hamuli of hind wing beginning at the tip of the subcostella.

Vespula is a Holarctic genus. In the Old World it is found all over Europe, in Northern Africa, in the Canary Islands, and in the Palaearctic portion of Asia. It barely enters the Oriental Region in the mountains of Assam, Sikkim and Tenasserim. In North America it occurs throughout the Nearctic Region (northward in Alaska to 70° N. lat.), but is very rare in Mexico. Two species occur near Mexico City and one of these has even been taken at Puerto Barrios, Guatemala.

As may be gathered from the generic description, the species of *Vespula* are much less uniform in some of their characters than those of *Vespa,* so that it is relatively easy to arrange them into a number of groups. Rohwer (1916) has proposed a subgenus *Dolichovespula* for the species with a long oculo-malar space. Although this character in itself appears to be of little value, it is to some extent correlated with other, more fundamental peculiarities; so that *Dolichovespula* probably represents a natural group of species, equivalent to the remainder of the *Vespulae.* Both subgenera have the same general distribution.

1. Subgenus **Vespula,** proper. In a subgeneric sense the name *Vespula* must be retained for any group of species containing the genotype, *Vespa austriaca* Panzer. It therefore corresponds to Schmiedeknecht's *Pseudovespa.*

> Oculo-malar space short, at most half the length of the penultimate antennal segment (in female and worker); often absent, the eye touching the mandible. Tibiae as a rule with long hairs on the upper face (except in *V. austriaca*). Vertical carina of the sides of pronotum obsolete or faintly marked in the lower portion only.

I have examined the following species of this subgenus:[1]

V. austriaca (Panzer), *V. squamosa* (Drury), *V. consobrina* (H. de Saussure), *V. germanica* (Fabricius), *V. maculifrons* (R. du Buysson) (= *V. communis* H. de Saussure), *V. occidentalis* (Cresson), *V. rufa* (Linnaeus), *V. saussurei* (W. A. Schulz)

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[1] The nomenclature of the North American species of *Vespula,* used in the present paper, is provisional, pending a critical study of these names.

(= *V. japonica* H. de Saussure), *V. sulphurea* (H. de Saussure), *V. vidua* (H. de Saussure), and *V. vulgaris* (Linnaeus).

V. koreensis (Radoszkowsky), *V. orbata* (R. du Buysson), and *V. structor* (F. Smith), which I have not seen, also belong in the subgenus *Vespula,* proper.

2. Subgenus **Dolichovespula** Rohwer, 1916, 'The Hymenoptera, or Wasp-like Insects, of Connecticut,' p. 642. Type by original designation: *Vespa maculata* Linnaeus, 1763.

> Oculo-malar space long, nearly as long as the penultimate antennal segment or longer (in female and worker). Tibiae always with long, erect hairs on the upper face, especially noticeable on the hind legs. Vertical carina of the sides of pronotum complete, well-developed in the upper portion.

I have seen the following species of the subgenus *Dolichovespula*: *V. arctica* Rohwer (= *V. borealis* Lewis, not of Kirby), *V. arenaria* (Fabricius) (= *V. diabolica* H. de Saussure), *V. maculata* (Linnaeus), *V. media* (Retzius), *V. norwegica* (Fabricius), and *V. sylvestris* (Scopoli).

V. lama (R. du Buysson), which is unknown to me, also appears to be a *Dolichovespula.*

The following three species of Vespinae I am unable to place in the proper genus: *Vespa formosana* Sonan (1927, Trans. Nat. Hist. Soc. Formosa, XVII, p. 121.—Formosa), *Vespa jurinei* H. de Saussure (probably a variety of *V. crabro*), and *Vespa minuta* Dover [1925, Jl. Proc. Asiatic Soc. Bengal, N. S., XX (1924), No. 6, p. 304.—Tenasserim; this is possibly not one of the Vespinae].

In the foregoing definitions of genera and subgenera I have not used secondary sexual characters of the males, mainly because I have not been able to examine that sex for the majority of the species. In my experience, the structure of the male antenna affords excellent specific characters, but whether it is of generic or subgeneric value is open to question. Thus, both species of *Provespa* have the thirteenth segment squarely truncate; but, whereas the flagellum of *P. anomalo* is without "tyloides," that of *P. barthelemyi* shows them very distinctly as raised longitudinal ridges (although R. du Buysson does not mention them).

Of *Vespa* I have seen males of *V. ducalis, V. crabro,* and *V. tropica* only, all of which bear tyloides on the flagellum. According to R. du Buysson, they also occur in *V. orientalis, V. mandarinia, V. magnifica, V. nigrans, V. analis, V. walkeri, V. bellicosa, V. bicolor, V. basalis, V. velutina, V. auraria,* and *V. mon-*

golica; but the males of the other species are either undescribed or have not been examined.

The males of *Vespula* may be with or without tyloides. These structures are absent in all the species of the subgenus *Vespula,* proper, so far as known. The subgenus *Dolichovespula,* however, contains a few species with very distinct tyloides (*V. maculata* and *V. media*), while in the majority these structures are either small or obsolete.

APPENDIX: SUPPOSED FOSSIL VESPINAE.

In view of the evident antiquity of the Vespinae, as a group distinct from the remainder of the Diploptera, any paleontological data bearing on this subject would be of unusual interest. A number of fossil insects have been either referred to "*Vespa*" or described as closely allied to that genus. The following is a brief discussion of these fossils.

The first mention of the occurrence of *Vespa* in the Baltic amber (probably of Oligocene age) seems to be by Gravenhorst (1835, Uebersicht Arb. Schlesis. Ges. Vaterl. Cult. im J. 1834, p. 92) in a mere list of amber insects. Menge (1856, Programm d. Petrischule, Danzig, p. 26) later described a *Vespa dasypodia* from the amber; but it is evident that this insect was not a diplopterous wasp; more likely it was a bee.

Cockerell [1910, Schrift. Phys.-Oekon. Ges. Königsberg, L, 1, (1909), p. 5] referred an amber insect to his genus *Palaeovespa* (based upon Miocene species of North America) and called it *P. baltica.* Cockerell's description shows that this fossil is undoubtedly one of the social Diploptera, and most probably one of the Vespinae, although the figure of the second submarginal cell rather suggests certain Polistinae or Polybiinae. It is unfortunate that the shape of the clypeus is unknown.

In a list of the genera recognized in a collection of fossil insects from Aix in Provence (Lower Oligocene), F. W. Hope (1847, Trans. Ent. Soc. London, IV, p. 252) mentions "a *Vespa,* if not a *Polistes,*" but this fossil has never been described.

O. Heer's *Vespa attavina* (1849, Neue Denkschr. Schweiz. Ges. Naturwiss., XI, 1, p. 101, Pl. VII, figs. 8 and 8*b*), from the Miocene of Parschlug, in Steiermark, was based upon a fore wing, apparently plaited lengthwise. Although the author compares it with *V. vulgaris,* his description and figure hardly bear this out; they are much more like the fore wing of certain *Polistes,* especially in the basal vein ending close to or at the stigma. The lengthened first discoidal cell makes probable the diplopterous nature of this fossil.

Vespa crabroniformis O. Heer (1867, Neue Denkschr. Schweiz. Ges. Naturwiss., XXII, 4, p. 6; Pl. III, fig. 15*a*), from the Lower Miocene of Radoboj, Croatia, is very superficially described; the body was badly crushed and the drawing of the wings is certainly unreliable. Most probably this fossil was one of the Diploptera, but to place it in one of the modern subfamilies would be a mere guess.

Schöberlin (1888, Societas Entomologica, III, p. 61) mentions the occurrence of *Vespa* in the Upper Miocene deposits of Oeningen, in Baden; but this fossil has not yet been described.

Cockerell has proposed the generic name *Palaeovespa* (1906, Bull. Mus. Comp. Zoöl., L, 2, p. 54. Type by original designation: *Palaeovespa florissantia* Cockerell) for a series of fossil insects from the (supposedly) Miocene shales of Florissant, Colorado. In all he has described five species: *P. florissantia* (1906, *loc. cit.,* p. 54), *P. scudderi* (1906, *loc. cit.,* p. 55), *P. gillettei* (1906, *loc. cit.,* p. 55), *P. wilsoni* [1915, Proc. Ac. Nat. Sci. Philadelphia, (1914), p. 640], and *P. relecta* (1923, Ent. News, XXXIV, p. 270). I have recently examined some of these fossils and reached the conclusion that they are probably Diploptera, but that it is impossible to decide whether they belong to the Vespinae rather than to one of the other subfamilies of social wasps [See Psyche, 1930, XXXVI, (1929) p. 367].

I conclude that, with the possible exception of *Palaeovespa baltica,* none of these fossils can be regarded as belonging to the Vespinae or as ancestral to the living genera of this subfamily.

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION.
(Tipulidae, Diptera.)

PART I.

BY CHARLES P. ALEXANDER, Amherst, Mass.[1]

The new species discussed at this time were for the most part included in interesting collections sent to me for identification by Dr. Mortimer D. Leonard and Mr. Millard C. Van Duzee. A further addition to the paper was contained in the Canadian National Collection, sent to me through the kind interest of Dr. James McDunnough. I wish to express my thanks and appreciation to the above-named entomologists for their continued cooperation in studying the Tipulid flies.

Limonia (Dicranomyia) erostrata n. sp.

General coloration ochreous; rostrum and first segment of antennae yellow; mesonotal praescutum with a median brown stripe; male hypopygium with the dorsal dististyle a stout pale rod that narrows gradually to an acute blackened tip; ventral dististyle a fleshy lobe that lacks a rostral prolongation.

Male.—Length about 6.5 mm.; wing 6.6 mm.

Rostrum light yellow; basal segments of palpi yellow, the outer segments infuscated. Antennae with the basal segment and sometimes the second light yellow; flagellum dark brown; flagellar segments oval, outer segments narrower. Head ochreous, the vertex more infuscated.

Mesonotum ochreous, with a brown median stripe that is subobsolete and more or less bifid behind, the lateral stripes less evident; scutal lobes brownish gray. Pleura ochreous yellow. Halteres destroyed by pests. Legs with the coxae and trochanters yellow; femora yellow, the tips slightly darkened; tibiae obscure yellow, darkened at tips; tarsi passing into dark brown. Wings light yellow, the stigma lacking; veins darker yellow. Venation: Sc_1 ending opposite origin of Rs, Sc_2 some distance from its tip; $m\text{-}cu$ very oblique, at the fork of M, subequal to the distal section of Cu_1.

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[1] Contribution from the Department of Entomology, Massachusetts Agricultural College.

Abdomen, including the hypopygium, ochreous. Male hypopygium with the caudal margin of the tergite deeply notched, the lateral lobes conspicuously setiferous. Basistyle with the ventro-mesal lobe relatively small, placed near the base of the style. Dorsal dististyle a very stout, broad-based rod, pale at base, gradually narrowed to an acute blackened tip. Ventral dististyle without a rostral prolongation, appearing as a pale, gently arcuated lobe that is a little longer than the dorsal dististyle, the surface with numerous scattered setae that are longer and more abundant at apex of style.

Habitat: Utah.

Holotype: ♂, Saltair, May 21, 1926 (*M. C. Van Duzee*). *Paratopotypes,* 1 male, 1 sex?, broken. Type returned to Mr. Van Duzee.

I cannot identify this species with any of those described by Doane. The male hypopygium has the same peculiar structure found in *L.* (*D.*) *signipennis* (Coq.).

Tricyphona simplicistyla n. sp.

Male.—Length about 14 mm.; wing 13.5 mm.

Close to *T. constans* (Doane), differing especially in the structure of the male hypopygium.

Antennal scape dark brown, the flagellum yellowish brown. Head pale, the vertex with a dusky area on either side of the median line. Praescutum almost uniform ochreous, the scutum conspicuously darker; scutellum pale; postnotal mediotergite pale, margined laterally with brown. Legs yellow, only the terminal tarsal segments a little darkened. Wings with the pattern quite as in *constans.* Venation: *Rs* in alignment with R_5; a supernumerary crossvein in cell R_3, placed about its own length before R_2; cell *1st* M_2 closed. Male hypopygium with the outer dististyle broad, the apex with abundant spinous setae. Inner dististyle a slender simple rod. Interbasal processes appearing as elongate, nearly straight rods, the tips acute, before apex with a small lateral spine.

T. constans has the outer dististyle very narrow at apex, with relatively few spines. Inner dististyle conspicuously bifid, the outer arm set with two powerful black spines.

It is possible that the supernumerary crossvein in cell R_3 is not a constant character but it is identical in both wings of the type.

Habitat: California. *Holotype:* ♂, Mill Valley, Marin Co. March 13, 1926 (*M. C. Van Duzee*). Type in the author's collection.

Rhaphidolabis (Rhaphidolabis) vanduzeei n. sp.

General coloration gray, the praescutum with three dark brown stripes; antennae black throughout; wings whitish subhyaline, with a conspicuous dark brown stigma; caudal margins of abdominal segments narrowly pale; male hypopygium with the dorsal interbase bifid at apex.

Male.—Length about 5.5 mm.; wing 7.2 mm.

Rostrum and palpi black. Antennae black throughout, 13-segmented; flagellar segments short-oval, gradually decreasing in diameter outwardly. Head gray, the center of the vertex slightly infuscated.

Mesonotum light gray, the praescutum with three conspicuous dark brown stripes; posterior sclerites of mesonotum more nearly immaculate. Pleura gray, the dorso-pleural region more ochreous. Halteres pale, with darkened knobs. Legs with the coxae gray; trochanters brown; remainder of legs dark brown, the tarsi passing into black. Wings whitish subhyaline, the stigma conspicuous, dark brown; a weak dusky clouding along the cord; veins dark brown. Venation: *Rs* short, angulated at near midlength; R_{4+5} subequal to the basal section of R_5; R_2 oblique, joined to R_1 near outer end; cell M_1 present; *m-cu* shortly beyond fork of *M*.

Abdominal segments dark brown, the extreme caudal margins of the segments pale; hypopygium dark. Male hypopygium much as in *cayuga;* dististyle more slender; dorsal interbase wider than in *cayuga* but narrower than in *rubescens.*

Habitat: California. *Holotype:* ♂, Mt. St. Helena, May 12, 1926 (*M. C. Van Duzee*). Type returned to Mr. Van Duzee.

I take great pleasure in dedicating this species to Mr. Millard C. Van Duzee, to whom I am indebted for many kindly favors in the past. *Rhaphidolabis vanduzeei* much resembles *R. stigma* Alexander but is really more closely allied to *R. cayuga* Alexander, from which it is told most readily by the conspicuous dark brown stigmal spot.

Eriocera alberta n. sp.

General coloration black, light gray pruinose; antennae (♀) 7-segmented, black; knobs of halteres white; wings white, with grayish brown seams to the veins; *Rs* angulated and spurred at origin; cell R_3 deep, parallel-sided for more than two-thirds the length; cell *1st* M_2 rectangular; *m-cu* at or close to the fork of *M; m-cu* shorter than the distal section of Cu_1; ovipositor with fleshy valves.

Female.—Length about 7 mm.; wing 9.2 mm.

Rostrum black, sparsely pruinose. Antennae 7-segmented, black, the scapal segments slightly pruinose; first flagellar segment longer than the succeeding two taken together; terminal segment oval, about one-half the length of the penultimate. Head broad, the vertical tubercle low; front and sides of anterior vertex light gray, the remainder of head dark gray.

Mesonotal praescutum light gray, with four blackish stripes, the intermediate pair only narrowly separated; scutum gray, the centers of the lobes darkened; scutellum and postnotum dark, gray pruinose. Pleura gray. Halteres dusky, the knobs white. Legs with the coxae and trochanters black, pruinose; femora brown, the tips broadly blackened, most extensively so on the short fore legs; remainder of legs black. Wings white, with a distinct grayish brown pattern that appears as narrow seams along the veins, including the origin of *Rs*, Sc_2, cord and outer end of cell *1st* M_2; stigma and fork of R_{2+3+4}; small paler circular clouds at ends of longitudinal veins; a circular cloud near center of cell *2nd* M_2; basal longitudinal veins with dark seams, most evident on vein *2nd A;* veins brown. Venation: Sc_1 ending shortly beyond the fork of *Rs*, Sc_2 a short distance from its tip; *Rs* relatively short, angulated and spurred at origin; R_{2+3+4} more than one-half longer than R_{2+3}; R_{1+2} a little longer than R_{2+3}; cell R_3 relatively deep, the enclosing veins parallel for about three-fourths their length: cell *1st* M_2 rectangular; *m-cu* at or just before the fork of *M; m-cu* considerably shorter than the distal section of Cu_1.

Abdomen black, sparsely pruinose, the sternites more heavily so; subterminal tergites polished black; ovipositor with fleshy valves. Tergal plate pruinose, with a V-shaped notch; sternal valves sheathing, dusky at base, the tips broadly light yellow.

Habitat: Alberta. *Holotype:* ♀, Lethbridge, June 24, 1929 (*J. H. Pepper*). Type in the Canadian National Collection.

Eriocera alberta is readily told from *E. longicornis* (Walker), the only other described Nearctic species with the fleshy type of ovipositor above described, by the number of antennal segments (the female of *longicornis* with 11 segments), coloration of the wings and the venation. It seems highly probable that the male of the present species will be found to have short antennae.

Rhabdomastix (Sacandaga) leonardi n. sp.

General coloration light yellow, handsomely patterned with black, including three conspicuous stripes on the praescutum; vertex with a conspicuous blackened area.

Female.—Length about 7.5 mm.; wing 6.5 mm.

Described from an alcoholic specimen.

Rostrum yellow, slightly darkened above; palpi very reduced. Antennae with the basal segment light yellow, the second and third segments black; remaining segments broken; first flagellar segment smaller and scarcely longer than the second scapal. Head light yellow, the vertex with a broad black mark extending to the posterior margin, bordered on the posterior vertex by more reddish.

Mesonotal praescutum light yellow with three conspicuous black stripes, the median stripe weakly bifid behind and ending far before the suture; lateral stripes crossing the suture onto the scutal lobes; pseudosutural foveae black; median region of scutum blackened; scutellum yellow; postnotal mediotergite yellow, weakly darkened medially, the posterior portion with two approximated black oval areas. Pleura yellow, handsomely variegated with small dark marks, including the propleura, anepisternum, ventral sternopleurite and meron, and ventral pleurotergite. Halteres pale, the knobs light yellow. Legs with the coxae yellowish brown; trochanters pale; remainder of legs broken. Wings grayish subhyaline, the stigma barely indicated; veins black, the prearcular, costal, subcostal and radial veins light brown. Venation: Sc_1 ending about opposite two-thirds the length of Rs, Sc_2 far from its tip, Sc_1 alone about one-third Rs; R_3 short and nearly perpendicular; distance on costa between R_{1+2} and R_3 a little longer than the latter; R_4 gently arcuated, a little shorter than the petiole of cell R_3.

Abdomen light brown, the tergites vaguely darkened basally, the genital segment more darkened medially.

Habitat: Montana. *Holotype:* alcoholic ♀, Bozeman, July 19, 1929 (*M. D. Leonard*). Type in the author's collection.

Rhabdomastix leonardi is named in honor of my old friend and co-worker on the Tipulidae, Dr. Mortimer D. Leonard. The species is very distinct from the other described American species of the genus. The highly contrasting yellow and black pattern of the head and thorax is somewhat suggestive of that found in many species of the Tipuline genus *Nephrotoma.* It is possible that in fresh specimens the colors as above described may be somewhat dulled by a pollinosity or pruinosity not evident in the alcoholic type.

Erioptera (Ilisia) bispinigera n. sp.

General coloration obscure yellow, the praescutum with three nearly confluent dark brown stripes; pleura dark, striped longitudinally with pale; halteres pale yellow; wings with cell M_2 open, vein *2nd A* short and straight; male hypopygium with the inner dististyle bidentate on lateral margin; gonapophyses entirely blackened, very unequally bifid.

Male.—Length about 4.5 mm.; wing about 4.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi brownish black. Antennae with the scapal segments dark brown, the flagellum paler; flagellar segments oval. Head chiefly dark brown.

Mesonotal praescutum yellow with three nearly confluent dark brown stripes; pseudosutural foveae dark; scutum obcure yellow, each lobe with the center dark brown; scutellum obscure yellow; postnotal mediotergite dark brown medially, the lateral margins narrowly pale yellow. Pleura chiefly dark brown, with a broad conspicuous yellowish longitudinal stripe extending from behind the fore coxae to the base of the abdomen; dorso-pleural region pale. Halteres relatively elongate, pale yellow throughout. Legs with the fore coxae brownish yellow, the other coxae pale yellow; trochanters pale yellow; remainder of legs broken. Wings grayish subhyaline, the diffuse stigma vaguely darker; veins brown. Venation: veins beyond the cord entirely as in the subgenus *Erioptera;* cell M_2 open; vein *2nd A* short and straight, as in *Ilisia.*

Abdomen dark brown, the pleural region pale; hypopygium obscure brownish yellow. Male hypopygium with the outer dististyle an expanded black structure, the dilated apical portion with microscopic denticles. Inner dististyle shorter, blackened, the outer or lateral margin with two conspicuous black spines, one at near midlength, the second nearly apical in position. Gonapophyses appearing as entirely blackened plates, the basal half dilated, very unequally bifid, the outer arm produced into a slender rod, the tip acute, with three or four small appressed lateral teeth; inner arm short and stocky, set with conspicuous teeth.

Habitat: Montana. *Holotype:* alcoholic ♂, Bozeman, July 19, 1929 (*M. D. Leonard*). Type in the author's collection.

Erioptera bispinigera is very doubtfully a member of *Ilisia,* in which subgenus I am placing it merely on the course of vein *2nd A*. It may be remarked that all of the subgenera of *Erioptera* are highly artificial and becoming more so with the constant accession of new material.

Erioptera (Ilisia) laevis n. sp.

Male.—Length about 4.2–4.5 mm.; wing 5–5.5 mm.

Very similar in the pattern of the wings and legs to *E. armillaris,* differing especially in the structure of the male hypopygium.

General coloration of body darker, especially the thoracic notum which is dark grayish brown instead of yellowish brown. Male hypopygium with the outer dististyle relatively small, the apex simply clavate, not emarginate on outer margin. Gonapophyses appearing as simple black horns that are slender, nearly straight, the margins quite smooth.

E. (*I.*) *armillaris* Osten Sacken has the outer dististyle very large, the head with the outer margin conspicuously emarginate to produce an obtuse lateral point. Gonapophyses stout, abruptly narrowed to an acute point, the outer margin before this apex microscopically spinulose.

E. (*I.*) *indianensis* Alexander has the outer dististyle small and slender, the apex only feebly dilated, entire. Gonapophyses appearing as curved slender hooks, the long tips acute, the margins entirely smooth.

Habitat: Northeastern North America. *Holotype:* ♂, Chesterfield Gorge, Massachusetts, altitude 850 feet, August 2, 1928 (*C. P. Alexander*). *Paratypes,* ♂, Amherst, Massachusetts, July 18, 1928 (*C. F. Clagg*); ♂, Hazleton, Pennsylvania, June 29–July 18, 1910 (*W. G. Dietz*). Type in the author's collection.

There can be no doubt but that there are three distinct species confused under the name of *armillaris.* The wing-pattern is almost identical in all three but the structure of the male hypopygium is very different in the various species.

OBSERVATIONS ON THE NEST OF APHAENOGASTER FULVA SUBSP. AQUIA BUCK. (FORMICIDAE, HYMENOPTERA.)[1]

George O. Hendrickson, Ames, Iowa.

While collecting insects along a roadside five miles south of Cedar Falls, Iowa, July 17, 1926, the author came across a nest of the ant, *Aphaenogaster fulva* subsp. *aquia* Buck. Here a strip of upland prairie vegetation about one rod wide and relatively undisturbed was noticed at the south side of the road. The narrow tract showed the typical aspect of a *Stipa spartea-Andropogon scoparius* (needle grass-beard grass) association, and the soil was a well-drained, brown, sandy loam occurring well toward the top of a low hill. Because such prairie is very scarce in Iowa at this date in her history our party of collectors decided to sweep this vegetation thoroughly for typical insects.

Soon after he had begun to sweep the author's attention was drawn to a piece of rusted tin about ten inches wide and two feet long lying on the ground among the grasses and about ten feet from the wheel tracks. Because such an object might harbor a desired insect or two the author felt prompted to turn the tin over. Several large jawed ants met the approach of the author's hand and their pinches were not tokens of welcome; but thereby the observer's curiosity was incited further. Beneath the tin a colony of ants had excavated several shallow rooms that were connected by runways. Three or four holes led from the rooms of the north end deeper into the ground. At that end in a nursery about six inches in diameter were seen approximately one hundred larger larvae and pupae. Almost immediately the nurses began to carry their charges out of sight into the holes which led to a lower nursery. At the end of thirty minutes the larvae and pupae were all out of the observer's reach and sheltered from the hot rays of the midday sun.

Toward the south end of the nest a granary four inches in diameter contained a few seed coats and partially eaten achenes of panic grass (*Panicum Scribnerianum* Nash.). In a second room of the same size as the granary occurred a small pile of the exoskeletons and appendages of some ants. The colors and sizes of the remains suggested the species *Formica fusca* L. to the author. This is a somewhat larger ant than *A. fulva aquia,* the living inhabitants of the nest.

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[1] Contribution from department of Zoology and Entomology, Iowa State College.

During these observations an open salve box containing a few small dead insects was placed rather absentmindedly near the nest of ants. Later when the box was noticed three members of the colony were seen vigorously tugging at the fortunately located food supply. Interference on the part of the author and owner met with an attack by one of the foragers which stood up and fought for the spoils. A second foraging ant could not be persuaded to loosen its hold upon a small leafhopper. Hence it went into a cyanide bottle as a specimen of the colony, but kept its hold on the prey until death. After collecting several more individuals the observer felt compelled to go on about other insect business. The tin roof was placed back into its former position in order that the ants might continue about their business.

The author is indebted to Dr. M. R. Smith for the identification of the species.

Erratum.—On Plate III, fig. 3, the last line of legend should read " swept away."—PHIL RAU.

A GENERIC REVISION OF THE EUCHLOINI (LEPIDOPTERA, PIERIDAE).

By Alexander B. Klots, Ithaca, N. Y.

Introduction.
Explanation of terms.
Generic synonymy and characters—Species lists.
Phylogeny.
Bibliography.
Explanation of figures.

Introduction.

Ever since entomologists first began to study the *Euchloini* with the generic classification of the group in mind, there has been much discussion on the subject, and there have been nearly as many different combinations of the species into different genera as there have been papers published. To one viewing all of this in retrospect the reason is evident, namely that most of the workers have placed their main reliance on the wing venation as a guide in determining the limits and relationships of the genera. Other workers in turn have realized that the venation was so variable that it was not at all suitable as a character for generic work, and these adopted the procedure of grouping all or nearly all of the species into one or two large genera, discounting not only the venation but also almost all other characters.

The writer undertook the study of the *Euchloini* in the hope that a study of the male genitalia might bring to light reliable generic characters. This has proved to be the case. These structures show none of the individual variation that makes the venation so untrustworthy. They furnish excellent grouping characters and appear, in most cases, to show excellent though never very great specific characters. The writer feels that in view of this lack of variation more confidence is to be placed in the structures of the genitalia than in the extremely variable venation, and has accordingly placed his main reliance in them. Other characters, however, have been by no means excluded.

Considerable use has been made of subgenera in an attempt to produce a system of classification which will seem in some degree natural, and to do away with that bane of most taxonomists, the long list of very small genera. Such use of subgenera can itself be carried too far, of course, but when used in moderation it appears to offer undoubted advantages which are too obvious to need discussion.

Explanation of Terms.

(See figures.)

In the structure of the male genitalia the *Euchloini* differ from most of the other *Pieridae* in possessing a flat curved *clasper* (cl) located on the inner face of the *harpé* (h). The *harpé* is comparatively simple, and has a smooth rounded termination. In many of the species its dorsal margin bears, at about the middle, a *dorsal spine* (d. s.) which may extend dorsad or may be curved inward and down between the harpés. The line of separation between the *tegumen* (t) and the *uncus* (u) is quite distinct. The uncus is sometimes distinctly swollen laterally at the base. The tegumen is occasionally swollen laterally just cephalad of the base of the uncus (fig. 6). The *vinculum* (v) is dorsally entire, though considerably narrowed. The *saccus* (sac) is in some cases fairly long and slender (fig. 4), but in others is very short and thick (figs. 7, 9). A small shield-shaped *juxta* (jux) is always present, although in some species very small. The *penis* (p) is rather short and is basally curved, sometimes strongly so (fig. 9). It bears near the base an area of heavier chitinization, and may in addition have a small rounded *basal prong* (b. p. p.—figs. 8–9).

GENERIC SYNONYMY AND CHARACTERS—SPECIES LISTS.

In the lists of species included in the various groups those names preceded by a question mark are species which the writer has not had the opportunity of examining, but which have been included on the basis of similarity in color and pattern to species which he has examined. No attempt has been made at revising the synonymy of the species. The synonymy of Röber (1906, 1910) has been followed in this respect, even though changes in synonymy have more recently been advocated, since his is the most recent work treating of the entire group. Races have been included in the list where there seems to be a possibility of their constituting distinct species.

Bibliographic references will be found at the end of the article. To avoid repetition none have been given in full in either the text or the lists. Only the most important and complete revisions have been included, since most of the local or fragmentary lists published have no significance in a study of the group as a whole.

Anthocharis Boisduval 1832, type *cardamines* L.

Generic characters: Males with apex of primary with an orange patch (except *lanceolata* Boisd.); R_2 arising from cell; dorsal margin of harpé evenly curved, bearing no structures; clasper simple, rounded; uncus slender, slightly if at all swollen at base, with no dorsal prominences; saccus more than twice as long as thick.

Subgenus *Anthocharis* Boisd. 1832, type *cardamines* L.
< *Papilio* Linnaeus 1761
< *Euchloë* Hübner 1816
< *Anthocharis* Boisduval 1832
< *Anthocharis* de Villiers & Guénée 1835
< *Anthocharis* Boisduval 1836
< *Anthocharis* sect. II Doubleday 1846
< *Euchloë* Butler 1870
= *Euchloë* Kirby 1873
= *Euchloë* Scudder 1875
< *Euchloë* Kirby 1875
< *Anthocharis* Schatz 1892
< *Euchloë* Beutenmüller 1898
> *Euchloë* Grote 1898
< *Euchloë* Butler 1898a
< *Euchloë* Butler 1898b
< *Euchloë* Grote 1900
< *Euchloë* Verity 1905
< *Anthocharis* Rober 1906 & 1910

Subgeneric characters: Apex of primary rounded, never falcate.

Species included:
cardamines L.
? *bambusarum* Oberthür
gruneri Herrich-Schäffer
damone Boisduval
eupheno L.
euphenoides Staudinger
sara Boisduval
cethura Felder
pima Edwards

Subgenus **Falcapica,** nomen nov., type *genutia* Fabricius.
< *Papilio* Fabricius 1793
< *Euchloë* Hübner 1816
< *Anthocharis* Boisduval 1836
< *Anthocharis* sect. II Doubleday 1846
> *Midea* Herrich-Schäffer 1867 (*nec Midea* Bruzelius 1854)
< *Euchloë* Butler 1870
= *Euchloë* Scudder 1872
= *Anthocharis* Scudder 1875
= *Midea* Scudder 1875
> *Midea* Kirby 1875
= *Midea* Schatz 1892
< *Euchloë* Beutenmüller 1898
< *Euchloë* Holland 1898
< *Euchloë* Grote 1898
< *Euchloë* Butler 1899 a & b
= *Midea* Grote 1900
< *Euchloë* Staudinger & Rebel 1901
< *Synchloë* Dyar 1902
< *Euchloë* Verity 1905
= *Midea* Röber 1906–10

Subgeneric characters: Apex of primary falcate, sometimes strongly so.

Species included:
genutia Fabricius
lanceolata Boisduval
bieti Oberthür
scolymus Butler

Anthocharis Boisduval was first proposed in 1832 with *cardamines* as the sole species included, so that *cardamines* automatically became the genotype. The genus was first based on larval characters, which is possibly the reason for the fact that it has been almost universally attributed to Boisduval in the "Species Général" of 1836. In this latter work it includes a long list of species of which *genutia* Fabr. is one. From this probably arose Scudder's belief that *genutia* was available for the genotype.

Midea Herrich-Schäffer was proposed with *genutia* as the sole species included, so that *genutia* automatically became the genotype. *Midea* Herrich-Schäffer is, however, a homonym of *Midea* Bruzelius 1854. See also *Midea* Walker 1863.

The species here included in the genus *Anthocharis* are all very similar to each other in the structure of the genitalia. Specific differences are present, but are slight. Previous authors who have grouped these species into two or more genera or subgenera have usually based their action on the venation. As pointed out by Butler (1899b) and as a careful study of an adequate series of specimens will show, such a proceeding is extremely unwise, due to the great amount of individual variation found in the venation of a number of the species. The writer has therefore made use of the falcate apex of the primary as being the only major character not subject to variation and giving reasonable results.

Of the species here placed in the subgenus *Anthocharis,* the females of *cardamines, gruneri* and *damone* lack orange on the apex of the primary above, while the females of the other species possess orange in this area. Obviously the use of this character, which would separate *gruneri* and *damone* from *eupheno* and *euphenoides,* is not to be considered.

Nor can use be made of the number of radials in the primary, for in this respect *sara* is quite variable (Butler 1899b), *cethura* and *pima* constantly possess four, and the other species five. Of the species here placed in *Falcapica, lanceolata* varies considerably in the number of the radials. About half of the specimens of this species which the writer has examined possess five radials on either one or both wings, although R_5 is always very short. This variation in *lanceolata* was also noticed and commented upon by Butler (1899b).

Zegris Rambur 1836, type *eupheme* Esper.

> Generic characters: Apex of primary of male with an orange patch, usually very narrow; apical markings of primary extending never more than slightly over halfway from apex to end of cell; dorsal margin of harpé at about middle produced dorsad in the form of a triangular flap or tooth; saccus never twice as long as thick, sometimes as thick as long; penis lightly bent near base, with a basal heavier chitinization but no basal prong.

Subgenus *Zegris* Rambur 1836, type *eupheme* Esp.
< *Papilio* Esper 1805
< *Anthocharis* de Villiers & Guénée 1835
> *Zegris* Rambur 1836
> *Zegris* Boisduval 1836
> *Zegris* Doubleday 1846
> *Zegris* Butler 1870
= *Zegris* Scudder 1875

$>$ *Zegris* Kirby 1875
= *Zegris* Schatz 1892
< *Zegris* Butler 1899a
< *Zegris* Butler 1899b
= *Zegris* Grote 1900
= *Zegris* Staudinger & Rebel 1901
= *Zegris* Verity 1905
< *Zegris* Röber 1906

Subgeneric characters: Primary with 5 radials, M_1 stalked on R_s usually more than halfway from cell to base of R_3; R_2 usually stalked on R_s, very seldom arising from end of cell; dorsal margin of harpé at middle produced to form a larger flap than in subgenus *Microzegris*; clasper somewhat narrowed at middle; saccus very short, little if any longer than thick.

Species included:
eupheme Esper
fausti Christoph

Subgenus *Microzegris* Alpheraky 1913, type *pyrothoë* Eversmann.

< *Pontia* Eversmann 1832
< *Anthocharis* De Villiers & Guénée 1835
< *Zegris* Boisduval 1836
< *Zegris* Doubleday 1846
< *Euchloë* Butler 1870
< *Euchloë* Kirby 1875
< *Anthocharis* Schatz 1892
< *Euchloë* Staudinger & Rebel 1901
< *Euchloë* Verity 1905
< *Euchloë* Röber 1906 & 1910
= *Microzegris* Alpheraky 1913
= *Pyrothoia* Verity 1929

Subgeneric characters: Primary with 4 radials, R_5 missing; M_1 stalked on R_s usually less than halfway from cell to base of R_3; R_2 usually arising from end of cell; dorsal margin of harpé at middle bearing a very small tooth; clasper very slightly narrowed at middle; saccus considerably longer than thick.

Species included:
pyrothoë Eversmann

Zegris has been almost constantly held as a distinct genus, perhaps more because of the peculiar structure of the pupa and extraordinary method of pupation as described by Rambur (1836) than because of any other characters. Recently some doubt has arisen as to the accuracy of Rambur's statements (Riley 1926), although the writer is not aware of any definite proof one way or the other. For this reason the pupal characters have been omitted from the above list of subgeneric characters. The writer considers that even should the pupation of *Zegris* be proven to be normal the species would still be worthy of generic separation on other grounds.

The shorter, more abruptly clubbed antennae, bushier palpi and heavier vestiture have been also frequently cited as generic characters for *Zegris.* These characters do not appear very distinct, although worth passing mention. Butler (1899a) placed *cethura* and *pima* in *Zegris* on the antennal character and (1899b) placed *olympia* in *Zegris* for the same reason in addition to pattern similarities. In his placing of *olympia* he has been followed by subsequent authors. Except in the matter of the antennae *cethura* and *pima* are evidently closely related to the species of *Anthocharis,* where the present author has placed them. *Olympia* shows close relationship to the species of *Euchloë* and accordingly has been placed there for the present. It does, however, seem to be more closely related to *Zegris* than are the other species of *Euchloë,* and probably represents somewhat of a transitional form. The life history of *olympia* is perfectly normal, showing none of the peculiarities described by Rambur for *Zegris* (Shull 1907).

Pyrothoë shows distinct differences from *eupheme* and *fausti* as cited in the subgeneric characters. The writer accordingly feels that *Microzegris* is worth retaining as a subgenus, although it is certainly not to be regarded as a distinct genus. The original proposal of *Microzegris* is, incidentally, very obscure, and appears to have been missed by all reviewers. It constitutes a beautiful example of the fact that when new names are proposed the author should emphasize the fact in every way possible.

Euchloë Hübner 1816, type *belia* Cramer.

Generic characters: Apex of primaries never with orange patch; primary normally with five radials; M_1 normally arising halfway from cell to base of R_3; middle discocellular of primary normally short; dorsal margin of harpé at about middle produced to form a strong pointed flap or tooth; penis strongly curved near base; saccus always longer than thick.

Subgenus *Euchloë* Hübner 1816, type *belia* Cramer.

< *Papilio* Cramer 1782

< *Euchloë* Hübner 1816

< *Anthocharis* de Villiers & Guénée 1835
< *Anthocharis* Boisduval 1836
< *Anthocharis* sect. II Doubleday 1846
< *Euchloë* Butler 1870
< *Euchloë* Kirby 1875
< *Phyllocharis* Schatz 1892
< *Euchloë* Beutenmüller 1898
< *Euchloë* Holland 1898
< *Anthocharis* Grote 1898
< *Euchloë* Butler 1899a
< *Euchloë* Butler 1899b
< *Anthocharis* Grote 1900
< *Euchloë* Staudinger & Rebel 1901
< *Synchloë* Dyar 1902
< *Euchloë* Verity 1905
< *Euchloë* Röber 1906–10

Subgeneric characters: Ground color of wings always white (creamy white in some female forms); dark markings of secondaries beneath not normally so heavy as to cover practically all of wing; pointed flap of dorsal margin of harpé long, heavily chitinized, projecting dorsad, then bent mesad and ventrad with termination between harpés; penis not so strongly bent basally as in subgenus *Elphinstonia,* with no basal prong; larva apparently not so strongly tuberculate as larva of *Elphinstonia.*

Species included:
belia Cramer
orientalis Bremer
daphalis Moore
? *venosa* Boisduval
ausonides Boisduval
creusa Doubleday & Hewitson
olympia Edwards
belemia Esper
? *seitzi* Röber
falloui Allard

Subgenus nov. **Elphinstonia,** type *charlonia* Donzel.
= *Anthocharis* Donzel 1842
< *Anthocharis* sect. II Doubleday 1846
< *Euchloë* Kirby 1875
< *Phyllocharis* Schatz 1892
< *Euchloë* Staudinger & Rebel 1901

< *Euchloë* Verity 1905
< *Anthocharis* Röber 1906–10

Subgeneric characters: Ground color of wings white or yellow; dark markings of secondaries beneath heavy, often covering practically all of wing; pointed flap of dorsal margin of harpé shorter and less heavily chitinized than in subgenus *Euchloë*, extending above dorsal margin of harpé, not bent mesad and ventrad; penis very strongly bent basally, with a short blunt basal prong; larva apparently somewhat more heavily tuberculate than larva of *Euchloë*.

Species included:
charlonia Donzel
? *c. tomyris* Christoph
? *c. pechi* Staudinger
tagis Hübner
? *lucilla* Butler

The first type specification for *Euchloë* which the writer has been able to find is of *belia* Cramer by Butler (1870). Accordingly *belia* is here placed as the genotype. The fact that previous to this date various authors had used *Euchloë* to include *cardamines* alone in local lists does not fix *cardamines* as the genotype, as was claimed by Kirby (1872) and Scudder (1875).

Schatz (1892) erected *Phyllocharis* with *tagis* as the genotype to contain all of the species here placed in the genus *Euchloë*. This genus is a homonym of *Phyllocharis* Dalman (1824). The species here included in *Elphinstonia* appear to the writer well worthy of subgeneric distinction from the other members of *Euchloë*, because of the characters cited in the subgeneric description.

The male genitalia show very distinct specific differences between *tagis* and *charlonia*. Between the species of the subgenus *Euchloë* these structures show less marked specific differences, with the exception of *belemia* (figs. 10–12). The venation is often exceedingly variable, and studied by itself would mean little. As an example of this fact the writer has a very large series of *E. ausonides coloradensis*, all of which were taken in one field within a period of four days. From this series he can pick out specimens which, under previous systems of classifying the Euchloine genera by venation alone, would belong in at least three genera. Several of these specimens have only four radials, and one has five on one side and four on the other, with no other evidence of distortion. Surely so variable a character is not worthy of use for generic classification, especially when contrasted with characters as constant as those shown by the genitalia.

Phylogeny of Genera.

It is evident that phylogenetic work based on the venation of the *Euchloini* is not to be taken very seriously. Attempts at such work have indeed produced strange results, as for example when Tutt (1894b) postulated a rather close relationship between the *Euchloini* and *Leucophasia,* a genus which undoubtedly belongs in the *Dismorphiinae.* In this respect the work of Cockerell (1889), Dyar (1894) and Tutt (1894a) is also to be noted.

The great amount of variation found in the venation does, however, point to the fact that the *Euchloini* must occupy more or less of an intermediate position between groups which have a relatively stable primitive venation and other groups which possess a stable specialized venation.

The possession of a clasper in the male genitalia may be safely regarded as primitive. In this respect the *Euchloini,* together with the genera *Cathaemia, Mylothris, Hebomoia, Hesperocharis* and *Eroessa,* differ from the rest of the *Pieridae.* Of these five genera, *Cathaemia, Hebomoia* and *Hesperocharis* possess a *scaphium,* or scaphium-like structure, which is very much like a structure found in many *Papilionidae* and *Nymphalidae. Eroessa* shows the closest relationship to the *Euchloini* in every respect. The pupa of *Hebomoia* appears to be very similar to the *Euchloine* pupa. That of *Mylothris* is entirely different, and shows a relationship to *Pieris.* The writer considers that *Eroessa, Hesperocharis* and *Hebomoia* are closely related to the *Euchloini,* but that the similarity of *Mylothris* and *Cathaemia* in possessing a clasper is not to be regarded as evidence of any close relationship.

The pupa of the *Euchloini,* as pointed out by Tutt (1894), must be considered as highly specialized because of its extreme rigidity.

Within the *Euchloini* a fairly close correlation is evident between reduction in venation and reduction in genitalia. The species of *Euchloë* which have the most complicated genitalia all possess five radials except in abnormal cases. The species of *Elphinstonia* likewise possess five radials, but the genitalia show a certain amount of reduction in the *dorsal spine* of the harpé. The species of *Zegris* possess five radials, but the dorsal spine is still further reduced. In *Microzegris pyrothoë* only four radials occur, and the dorsal spine is greatly reduced so that the genitalia approximate those of *Falcapica* and *Anthocharis.* In these two latter genera the genitalia are very simple, a simplicity often correlated with the loss of R_5. The writer therefore believes that the trend of development in the *Euchloini* has been from a more complicated genitalic structure to a simpler one, and from the possession of five radials to the possession of only four. One would, of course, expect the groups to show evidence of sidewise development from the main line of the development of the group, and as such may be regarded the *basal prong of the penis of Elphinstonia,* the extremely short *saccus* of *Zegris,* the falcate apex of the primary of *Falcapica,* and many minor structures. If *Hebomoia* and *Eroessa* are postulated as ancestral forms then the loss of the orange patch on the primary in *Euchloë* and *Elphinstonia* must represent a " sidewise specialization " in those groups, as must the development of the yellow ground color in *charlonia* and its allies. It is all pure speculation, in which one author's guess is quite as good as another's.

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PLATE VI.

EXPLANATION OF FIGURES.

Fig. 1. Lateral aspect, male genitalia, *Anthocharis* (*Anthocharis*) *cardamines* L. with left harpé removed, lateral aspect of penis below, caudal aspect of juxta at left.

Fig. 2. Lateral aspect of male genitalia of *Anthocharis* (*Anthocharis*) *eupheno* L. with left harpé removed, lateral aspect of penis below, caudal aspect of juxta at left.

Fig. 3. Lateral aspect of male genitalia of *Anthocharis* (*Anthocharis*) *cethura* Felder with left harpé removed, lateral aspect of penis below.

Fig. 4. Lateral aspect of male genitalia of *Anthocharis* (*Falcapica*) *genutia* Fabr. with left harpé removed, lateral aspect of penis below, caudal aspect of juxta at left.

Fig. 5. Lateral aspect of male genitalia of *Anthocharis* (*Falcapica*) *scolymus* Butler with left harpé removed, lateral aspect of penis below, caudal aspect of juxta at left.

Fig. 6. Lateral aspect of male genitalia of *Zegris* (*Microzegris*) *pyrothoë* Eversm. with left harpé removed, lateral aspect of penis below, lateral aspect, enlarged, of dorsal spine (above) and caudal aspect of juxta (below) at left.

Fig. 7. Lateral aspect of male genitalia of *Zegris* (*Zegris*) *eupheme* Esper with left harpé removed, lateral aspect of penis below, lateral aspect, enlarged, of dorsal spine (above) and caudal aspect of juxta (below) at left.

Fig. 8. Lateral aspect of male genitalia of *Euchloë* (*Elphinstonia*) *tagis bellezina* Boisd. with left harpé removed, lateral aspect of penis below.

Fig. 9. Lateral aspect of male genitalia of *Euchloë* (*Elphinstonia*) *charlonia* Donzel with left harpé removed, lateral aspect of penis below, lateral aspect, enlarged, of dorsal spine (above) and caudal aspect of juxta (below) at left.

Fig. 10. Lateral aspect of male genitalia of *Euchloë* (*Euchloë*) *belemia* Esper with left harpé removed, lateral aspect of penis below, lateral aspect, enlarged, of dorsal spine straightened dorsad (above) and caudal aspect of juxta (below) at left.

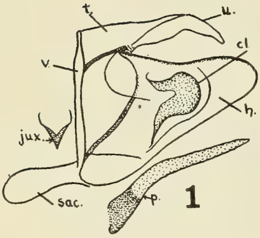
Fig. 11. Lateral aspect of male genitalia of *Euchloë* (*Euchloë*) *belia* Cramer with left harpé removed, lateral aspect of penis below, caudal aspect of juxta at left.

Fig. 12. Lateral aspect of male genitalia of *Euchloë* (*Euchloë*) *olympia* Edwards with left harpé removed, lateral aspect of penis below.

EXPLANATION OF ABBREVIATIONS.

b.p.p. = basal prong of penis
cl. = clasper
d.s. = dorsal spine of harpé
h. = harpé
jux. = juxta
p. = penis
sac. = saccus
t. = tegumen

PLATE VI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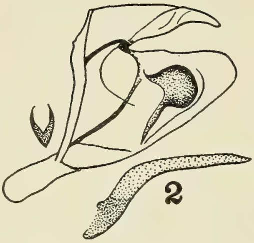

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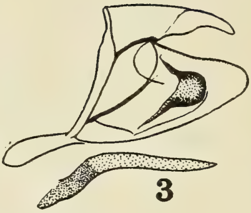

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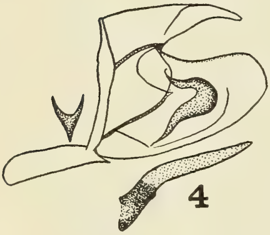

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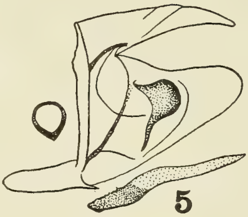

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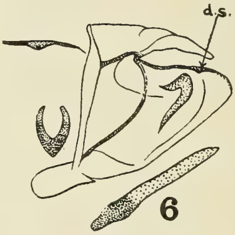

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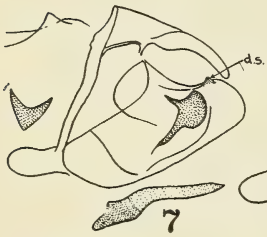

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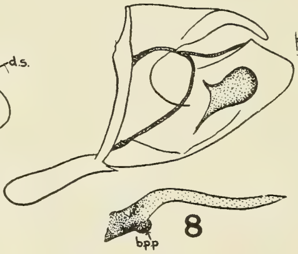

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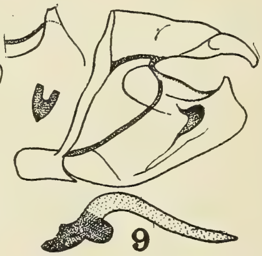

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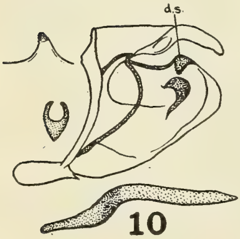

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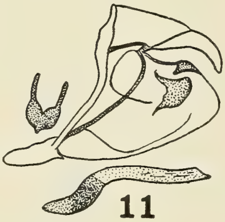

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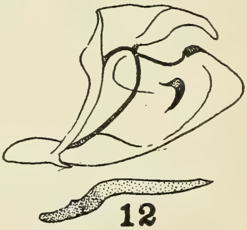

12

u. = uncus
v. = vinculum

In preparing genitalia and drawing them with a projection apparatus a certain amount of distortion cannot be avoided. The efforts of the author have been firstly to have as little distortion as possible, and secondly to have what distortion is present affect the specimens in the same manner. For the sake of simplicity the setae, hairs and scales on the harpés have been omitted. In some cases these appear to offer specific characters.

THE JAPANESE BEETLE ON STATEN ISLAND.

By Wm. T. Davis, Staten Island, N. Y.

On the 31st of August, 1928, Mr. Charles W. Leng found a Japanese beetle (*Popillia japonica* Newman) in the Museum of the Staten Island Institute of Arts and Sciences, that had some time previously flown to one of the windows and died on the ledge where the upper and lower sashes come together. This specimen is recorded in the Proceedings of the Staten Island Nature Club for September 22, 1928.

In 1929 Carol Baumann, 378 St. Mark's Place, brought two of the beetles to the Museum; one collected July 30 and the other on September 5.

On August 26, 1929, K. Kessig brought another specimen to the Museum, collected this time at 406 St. Mark's Place. As three living individuals came from that general locality in Tompkinsville, it would appear that the beetle was not uncommon somewhere in the vicinity.

A fifth specimen which may, however, have been imported in fruit or vegetables, was found in a grocery store in Tompkinsville on August 29, 1929.

POSITION OF STREPSIPTERA ON HOSTS.

By Charles Robertson, Carlinville, Illinois.

In 3 it is stated that in *Odynerus* usually one set of parasites falls under the 3rd segment and the other under the 4th; in *Polistes* usually the males are under 3 and 4, the females under 5; in *Chloralistus* and *Andrena* the normal position is under 4. Similar statements about *Odynerus* and *Polistes* are repeated in **4**, 275 and credited to Salt (3).

These observations are not new. In **2**, which relates exclusively to this subject, I tabulated 100 parasites occurring on 18 species of bees and 38 occurring on 17 species of wasps. In 30 cases parasites of *Odynerus* fell into two sets, 14 under 3, and 10 under 4. Of 36 parasites of *Chloralictus,* 34 were under 4. Of 55 of Andrenidae, all fell under 4. Of 8 of Panurgidae, 7 were under 4. My tables show that special mention of *Chloralictus* and Andrenidae is irrelevant, for 96 out of 100 parasites of the short-tongued bees in general fell under 4.

I also tabulated 467 cases of parasites of *Polistes,* given by Pierce. Of 306 males, 146 were under 3, and 101 under 4. Of 161 females, 115 were under 5.

In **4** all account of **2** is avoided and it is excluded from the "References," but mention is made of "*Odynerus ziziae* mss." This is the same insect as *Leionotus pedistris* listed in **1**.

To the dates of hosts mentioned in **1**, add after *Ptilandrena erigeniae* May 9; after *Sphex vulgaris,* add Inverness, Florida, Nov. 18; after *Odynerus erinnys,* add Nov. 11, 13, 21.

Specimens of *Proterosphex ichneumoneus, Leionotus foraminatus, fundatus* and *Odynerus erinnys* from me were not determined by Salt and Bequaert, as said in **3**. These statements cover up the fact that these cases were determined and recorded by me in **1** and **2**. Mr. Salt was instructed to turn over the specimens loaned by me to the Museum of Comparative Zoology. The specimens still show these determinations in my handwriting, except *L. foraminatus,* the label of which was removed by Salt.

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ORCHESTES TESTACEUS MUL.

By C. A. Frost, Framingham, Mass.

Four specimens of this beautiful little weevil have turned up in recent years; one at South Paris, Maine, on June 11, 1925, one at Westchester Lake, N. S. (near the old Londonderry Mines) on July 29, 1927, and two at Portaupique, N. S., on July 22, 1929; I once had a specimen from Ontario but this has been sacrificed on the altar of science. I have not been able to compare my specimens with European examples of the species and have accepted the determination of a correspondent.

These specimens have the size and shape of *pallicornis* Say and are of a brick-red color all over excepting the metasternum which is black. On each elytron a denuded vitta runs from the humerus obliquely back to the suture slightly behind the middle and there is a denuded spot adjacent to the juncture and extending almost or quite to the elytral margin. The rest of the elytra is covered with a spare vestiture of silvery pubescence.

I have often wondered whether these designs on so many of the small Coleoptera are caused by the fugacious nature of the pubescence on these particular areas or by abrasion in some peculiar manner, possibly in emerging from their breeding places or the pupal skin. Occasional examples of other species have been taken without denuded areas, and I recall specimens of *Elleschus bipunctatus* L. which were taken the past summer with the typically decorated forms.

EARLY REFERENCES TO THE BEHAVIOR OF AMERICAN SOLITARY WASPS.*

By Richard Dow, Cambridge, Mass.

Among the early observers of natural history in North America, John Bartram was the first to write about the solitary wasps. His observations were recorded in letters to Peter Collinson, of London, who presented them before the Royal Society in 1745, 1749, and 1763. Each paper subsequently appeared in the worthy *Philosophical Transactions.*

The first paper on " Some very curious Wasps Nests made of Clay " describes the nests of what are probably *Sceliphron caementarium* (Drury) and *Trypoxylon politum* Say. " The plain Clay-Nest is fabricated by a small black Wasp, of the same Species of that in Tab. III. *Fig.* 1. but less, that has a Speck or Stripe of Yellow in its Tail; and the Cells are made four or five together, joining Side by Side to each other. But the Clay-Nests that are so elegantly wrought are built by a purplish black Wasp, such as is figured Tab. III. *Fig.* 2.: After one Cell is formed, they stop it up, and join another to its End, and then add another to that; which makes these wrought Clay Fabrics longer than the plain ones." Curiously enough, both of the figures referred to seem to represent the same wasp (a member of the Sphecinae[1]). The identification of the two species depends largely on the nests, which are also figured and more carefully described.

The second paper of John Bartram is on the life history of the Great Black Wasp from Pennsylvania, which stores its burrows with " a large Green Grasshopper." Reinhard has quoted this article in his recent book, *The Witchery of Wasps,* showing that the wasp Bartram observed was *Chlorion* (*Ammobia*) *pennsylvanicum* (Linn.).

The third and last paper describes the habits of the Yellowish Wasp of Pennsylvania which feeds the larva from day to day, until it is full-grown. This is one of the first accounts of progressive provisioning by a solitary wasp, and was discredited by

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* Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 327.

[1] As used by Kohl.

Westwood in his *Introduction.*[2] Since the wasp is neither described nor figured, it has to be determined from its behavior. Ashmead thought it was a Bembicid, Parker included it in the Bembicini, and according to Dr. Bequaert, it is probably *Bembix spinolae* Lep.

A second early observer was Mark Catesby, a friend of both Bartram and Collinson. In 1731 and 1743, he published the first and second volumes of *The Natural History of Carolina, Florida and the Bahama Islands.* An appendix printed in 1748 contains figures and descriptions of two mud-daubers, *Vespa Ichneumon* and *Vespa Ichneumon coerulea.* In the "Linnaean Index of the Animals and Plants" which appeared in the third edition of 1771 and was presumably written by George Edwards, the editor, *Vespa Ichneumon* is not determined, but from the colored figure and the fact that it provisions a clay nest with spiders, it can be identified as *Sceliphron caementarium.*

Vespa Ichneumon coerulea is probably *Chalybion caeruleum* (Linn.), since it is determined in the Linnaean Index as *Sphex coerulea.* Although Linnaeus described two different species under that name, the index must refer to the second since the first was described as a species with subsessile abdomen. Linnaeus comments on the second *Sphex caerulea* as follows:[3] *"Catesb. car.* 3. *p.* 5. *t.* 5? *sed punctum nullum in alarum apice."* The spots on the tips of the wings are very conspicuous in Catesby's figure, but cannot be explained unless Catesby confused the mud-dauber with some other wasp, and drew, for example, a species of *Podium.* Catesby says that *coerulea* builds clay nests which he describes with sufficient detail to classify as those of *Trypoxylon politum.* Although *Chalybion* does not build its own nests, there is no record of its ever nesting in the cells of *Trypoxylon.* Thus Catesby was not only the first to say that *Chalybion* was a true mud-dauber, but he even associated it with the wrong type of nest.

Over fifty years later, Benjamin Henry Latrobe, a prominent architect of Philadelphia and Washington, also figured and described two mud-daubers. His paper was read before the American Philosophical Society in 1803, and published in the *Transactions* (1809). The same article was also published in England in the *Philosophical Magazine* (1806), but the text was different and without figures. The observations on which Latrobe based his contribution were made while he was in Virginia, and recorded in his journal along with brief notes on one or two other solitary wasps, four social wasps, and one or two bees.

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[2] *Introduction to the Modern Classification of Insects* 2: 207.

[3] *Systema Naturae* (12th edition) 1 (2): 941. 1767.

The mud-dauber which Latrobe calls *Sphex pennsylvanica* Linn., is probably *Sceliphron caementarium.* The figure is reasonably good and the yellow markings are described in the text. The other mud-dauber which is classified as *Sphex caerulea* Linn., is obviously *Trypoxylon politum.* Part of the description reads as follows: "From the scutum attached to the petiole, is extended a strong hook, which is very serviceable to him in securing his prey. His sting is not very painful, and soon ceases to be troublesome." Latrobe failed to notice any sexual differences in the specimens he observed, or he would have found that the wasp which captures the prey has no hook on the petiole, and that the wasp with a hook on the petiole cannot sting. He would also have discovered the presence of both sexes about the nest, a situation peculiar to the genus *Trypoxylon.*

In reviewing the contributions of these early naturalists, I have attempted only to classify their material according to our present nomenclature and bring their observations up to date. As a result, I have largely obscured both the scientific and historical importance of their work.

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Uloma imberbis Lec.—This seems to be a very scarce inhabitant of this part of the country if my luck in their capture is any criterion. One specimen from Framingham, April 12, 1905, and one from Monterey, August 1, 1920, are all I have to record for about 30 years of intensive collecting about here. Mr. H. C. Fall writes me that he has no specimens from New England and there is only one specimen in the collection of the Boston Society of Natural History, which bears no locality and the date of August 25, 1875.—C. A. Frost, Framingham, Mass.

Bugs at Light.—During the summer of 1929, the following Heteroptera flew into my house at night, attracted to light: *Myodochus serripes* Oliv., *Heraeus plebejus* Uhler, *Ligyrocoris diffusus* Uhler, *Trigonotylus ruficornis* Fall., *Tr. brevipes* Jak., *Deraecoris ruber segusinus* Reut., *Adelphocoris rapidus* Say. My house is set almost at the top of a hill in the City of White Plains, overlooking a damp meadow and a pond, in the grounds of Bloomingdale, on Westchester Avenue. Doubtless this situation explains the coming of these Heteroptera.—J. R. de la Torre-Bueno, White Plains, N. Y.

ON THE GENUS VIVIANIA WITH THE DESCRIPTION OF TWO NEW SPECIES FROM TEXAS. (TACHINIDAE, DIPTERA.)

By H. J. Reinhard, College Station, Texas.

The genus *Viviania* Rondani (*Biomyia* Rondani) includes about nine described North American species. These constitute a rather homogeneous and difficult group of muscoid flies, although the three species from Texas, here under consideration, are distinct and readily separable forms. I am indebted to Dr. J. M. Aldrich for the determination of the new species described herein as *angustifrons* and for pointing out that the not uncommon *lachnosternae* Townsend is a synonym of *georgiae* Brauer and Bergenstamm originally described from Georgia. The third local species, which I have represented by only three female specimens, is congeneric with *Viciania* but apparently is not assignable to any described form. It is herein described as *nocturnalis* new species.

Since the original description of *georgiae* Brauer and Bergenstamm is not easily accessible, and that of *lachnosternae* Townsend is based upon a single female specimen, it appears desirable to include a redescription of this species.

Viviania georgiae Brauer and Bergenstamm.

Viviania georgiae BB. Zweifl. d. Kaiserl. Mus., V, 1891, p. 312.

Viviania lachnosternae Tns. Tax. Mus. Flies, Smith. Misc. Coll., LI, 1908, p. 106.

Male: Eyes bare; front narrow and prominent below, at narrowest (before ocelli) 0.17 of the head width, (average of three, 0.18, 0.16, 0.16); one pair of verticals (inner) moderately strong; orbitals none; ocellars present, strongly proclinate, hardly at all divergent; frontals in a single row on either side, lowest ones below middle of second antennal joint, uppermost two reclinate; parafrontals gray pollinose, with scattered short black hairs extending below the frontals; parafacials bare, covered with thick dull gray pollen, nearly twice the width of third antennal joint; face not receding much, long and narrow, ridges rather prominent, bare except shortly above vibrissae; the latter situated the length of second antennal joint or more above the oral margin; antennae not reaching the lowest third of face, wholly reddish-yellow, third joint rather slender, straight or slightly concave on anterior edge, about twice the length of second; arista yellow, long and very thin on apical half, slightly thickened above base, penultimate joint hardly longer than broad; cheeks about one-third the eye height, gray pollinose, the yellow ground color apparent above; proboscis short, fleshy, labella large; palpi yellow, slender to tip, with black bristly hairs below on apical half; posterior orbits broad below and greatly narrowed toward the vertex, covered with dense gray pollen; occiput with sparse pale gray hairs.

Thorax and scutellum black, densely gray pollinose, pleura tinged with yellow along sutures; mesonotum with five black stripes; the outer broad and interrupted at suture; the intermediate ones ending shortly behind suture; the middle one narrow and less distinct, extending from base of scutellum hardly to the suture. Chaetotaxy: humeral 3; posthumeral 2 (posterior one small); acrostichal 3, 3 (variable); dorsocentral 3, 3 (variable); notopleural 2; presutural 2; intraalar 3; supraalar 3; postalar 2; sternoplural 2, 1; pteropleural 1 to 3; scutellum with 4 or 5 laterals (normal 4), apicals none or reduced to fine hairs; a preapical and a discal pair usually present though often asymmetrical; postscutellum normal; infrasquamal hairs black; calypters white with a faint yellow tinge, semitransparent.

Abdomen black, entirely covered with dull dense gray pollen which is tinged with brown on the hind margins of the intermediate segments; a dark median stripe and an irregular blackish spot on either side of third segment above apparent in rear view; first and second segments with one smallish erect median marginal pair of bristles; third with a marginal row of somewhat larger bristles; fourth with irregular discal and marginal rows; intermediate segments without discals, the hairs on the upper surface rather coarse evenly placed and depressed; venter of segments three and four without any modified vestiture; genital segments black, ordinary in size; fifth sternite with a deep U-shaped incision, the narrow inner margins of the lobes slightly reflexed, shining black.

Legs stout, blackish except the basal joints and knees which are yellow; claws and pulvilli moderately elongated; middle tibia with one bristle on the outer front side; hind tibia not ciliated.

Wings normal, hyaline; first posterior cell rather narrowly closed well before wing tip; all veins including costa yellow; third with two to four setules near base, others bare; costal spine short; epaulets yellow.

Female: Similar to male except as follows: front wider, at narrowest (vertex) 0.25 of head width (average of six, 0.23, 0.26, 0.25, 0.25, 0.23, 0.28); the usual two pairs of proclinate orbitals present; outer verticals nearly half as large as inner ones; claws and pulvilli shorter, etc. Ovipositor short and blunt, fitted for depositing macrotype eggs.

Length of male, 7 to 8.5 mm.; of female, 8.5 to 10 mm.

Described from three males and six females collected at College Station, Texas, June and July, 1917–1919, (H. J. Reinhard).

The type locality of this species is Georgia. It also appears to be correctly reported from Mississippi, New Mexico, Illinois, Washington, D. C., and New York. The host relationships are, so far as known, with adults of the genus *Phyllophaga.*

Viviania nocturnalis n. sp.

Female: Like *georgiae,* but much smaller and with black epaulets. Front not noticeably prominent below, 0.22 of head width (average of three, 0.23, 0.20, 0.24); antennae fully two-thirds the length of face, third joint black; arista of moderate length, black; thorax and scutellum as in *georgiae,* but with thinner pollen and the pleura wholly black in ground color; chaetotaxy as in *georgiae,* but the posterior posthumeral is absent, only one pteropleural developed and no preapicals present on scutellum; abdomen black, dorsum with thinner gray pollen, subshining in certain lights, a narrow interrupted median stripe visible in a flat rear view; ovipositor blunt, retracted in tip of abdomen, in one specimen with a large flat whitish egg attached; legs wholly black, otherwise as in *georgiae;* wings as in *georgiae.*

Length, 4.5 to 5 mm.

Type: Female, Cat. No. 42,882, U. S. N. M.

Described from two females collected at College Station, Texas, April 15, 1927, June 26, 1929, at night (H. J. Reinhard); and one female captured May 8, 1929, in light trap by S. E. Jones at College Station, Texas.

This species is nocturnal in habit and has been taken in close association with infestations of *Phyllophaga* spp. These observations may indicate the same general host relations as for *georgiae.* It resembles the latter species closely except in size.

Viviania angustifrons n. sp.

Male: Front at narrowest (before ocelli) 0.14 of head width, (average of four, 0.13, 0.15, 0.14, 0.14); parafrontals narrow at vertex widening rapidly to base of antennae, densely gray pollinose, with a few short black inconspicuous hairs outside and extending below the frontal rows; median stripe reddish-brown, but slightly narrowed in front of triangle extending on either side to vertex; inner verticals moderately developed, outer ones hairlike; frontal bristles short and rather weak, arranged in two rows extending to middle of second antennal joint, the uppermost pair reclinate and situated about on level with anterior ocellus; ocellars small, strongly proclinate and hardly at all divergent; orbitals none; parafacials bare, covered with dense gray pollen, at narrowest only slightly wider than third antennal joint; face gray pollinose, the yellow ground color apparent at vibrissal angles; ridges somewhat rounded or flattened below, bare except three or four short hairs above vibrissae; the latter situated hardly the length of second antennal joint above the level of oral margin; antennae about three-fourths the length of face, yellow, third joint sometimes slightly infuscated on outer side, about two and one-half times the length of second joint; arista of moderate length and distinctly pubescent, thickened near base which is yellow, apical three-fourths slender and blackish, penultimate joint short; proboscis short, labella fleshy; palpi yellow, rather slender, with a few black hairs beneath and shorter bristles at tips; cheeks about one-third the eye height, covered with thin pollen above through which the yellow ground color is distinctly apparent, below with denser gray pollen and numerous black hairs; occiput sparsely clothed with short black bristles which are intermixed with longer pale hairs on lower extremity; eyes bare.

Thorax gray pollinose, mesonotum with four distinct black stripes interrupted at suture, the outer thickened to triangular spots in front and extending postsuturally for three-fourths the distance to base of scutellum, inner ones narrower joined by a transverse stripe just behind suture and obsolete shortly posterior to anterior dorsocentral bristles; scutellum black (yellow in one specimen) covered with rather dense gray pollen which becomes thinner towards base. Chaetotaxy: acrostichal 2, 3 (anterior one small); dorsocentral 2, 3; humeral 2; posthumeral 1; presutural 1; notopleural 2; intraalar 3; supraalar 3; postalar 2; sternopleural 2, 1 (lower anterior one small); pteropleural 1; scutellum with three lateral and one discal pair, apicals reduced to fine hairs; calypters transparent, tawny, the rims whitish; infrasquamal setules black, small and inconspicuous; postscutellum normal.

Abdomen yellow, the narrow hind margin of segments one and two, apical half of third, and all of fourth darker in color; last three segments entirely covered with whitish pollen above except on an interrupted dark median stripe, on the intermediate segments the pollen fades at the sides and toward the posterior margins which are subshining; bristles on all segments rather weak; first with a median marginal pair; second and third each with marginal rows, no discals; fourth with a discal and marginal row; venter of segments three and four on each side with patches of pale, soft, very short hairs; genitalia small, inner forceps deeply divided but not divergent, tips not narrowed, shining black; outer forceps very thin, pale-yellow, tips broadly rounded and slightly bowed backward; penis short, the thickened distal portion with a small recurved hook at apex; fifth sternite yellow, deeply divided with a U-shaped incision, the lobes with black hairs on the darker inner margins.

Legs slender, without any strong bristles, tarsi black, other joints yellow, more or less infuscated; middle tibia with one bristle on outer front side, hind tibia with three or four short bristles on outer posterior side; claws and pulvilli elongated.

Wings ordinary in form; costa and all veins yellow; fourth with a rounded oblique bend, slightly concave near the tip so that the first posterior cell is narrowly open about the length of small cross vein before the exact wing tip; hind cross vein slightly nearer bend than to small cross vein; first vein bare, third with two or three small hairs near base; costal spine inconspicuous; epaulets black.

Female: Front narrowed before ocelli as in male, 0.16 of head width (average of five, 0.16, 0.16, 0.15, 0.15, 0.16); abdomen distinctly darker and but little or hardly at all yellow in ground color, the tip concealing a blunt egg-laying organ; without the usual orbital bristles and only one pair (inner) verticals developed; palpi larger and thickened apically; calypters white; puvilli less elongated, otherwise as in male.

Length of male, 5 to 7 mm.; of female, 5.5 to 7 mm.

Type: Male, Cat. No. 42,881, U. S. N. M. One male and four female paratypes also deposited in U. S. National Museum.

Described from 6 males and 10 females including type collected at College Station, Texas, April to July, 1917–1929, (H. J. Reinhard); and 2 males collected at Havana, Cuba, (Baker) received from Dr. J. M. Aldrich to whom they are returned.

The distinctly pubescent arista, greatly narrowed front in both sexes, absence of orbitals in the female, and modified vestiture on venter of third and fourth abdominal segments in the male are the principal characters in which the species differs from both *georgiae* and *nocturnalis.* The two males from Havana are somewhat larger and show less yellow on the abdomen but agree closely in other details with the remainder of the type series. The host relations are unknown.

ON THE HETEROPTERA COLLECTED BY GEORGE P. ENGELHARDT IN THE SOUTH AND WEST.

By J. R. de la Torre-Bueno, White Plains, N. Y.

What few Heteroptera Mr. George P. Engelhardt has collected in his various trips through the South and West during the last three years, he has very amiably handed to me for study. The records here given either extend the known distribution or confirm previous records.

In May, 1927, Mr. Engelhardt was in Texas, at College Station. On the 19th of the month he secured there 4 *Brochymena cariosa* Stål; one *Hymenarcys nervosa* Say; 3 *Mezira lobata* Say. At Brownsville he took 4 *Jadera haematoloma* H. S. and 16 *J. sanguinolenta* Fabr. According to Blatchley, *sanguinolenta* F. and *aeola* Dallas are the same. At any rate, this appears to be quite abundant at Brownsville. At San Antonio, he secured one *Lygaeus kalmii* Stål, typical; and a couple of *Solubea pugnax* Fabr.

While in Florida, he visited Lake Okeechobee on March 28, and secured 1 *Mormidea lugens* Fabr., 2 *Solubea pugnax* Fabr., 3 *Euthochtha galeator* Fabr., 1 *Namacus annulicornis* Stål and 1 *Oncocephalus geniculatus* Stål. At Royal Palm Park, Dr. Blatchley's own preserve, Mr. Engelhardt collected on February 23, 1929, 3 *Proxys punctulatus* P. B., 1 *Euschistus bifibulus* P. B., 2 *Edessa bifida* Say, 3 *Phthia picta* Drury, 3 *Triatoma sanguisuga* Lec., and one *Zelus bilobus* Say. At Marianna, on the 31st of March, he secured one *Thyanta calceata* Say, one *Leptoglossus phyllopus* and one *Zelus exsanguis* Stål.

Of these 22 records, those for Florida give new localities, as follows: *Thyanta calceata, Solubea pugnax, Proxys punctulatus, Euschistus bifibulus, Leptoglossus phyllopus, Phthia picta, Na-*

macus annulicornis, Oncocephalus geniculatus, Zelus bilobus. The record of *Zelus exsanguis* (a female, more or less teneral) merits special mention. Dr. Blatchley states that the only Florida record is that of Uhler, without any definite station. Here is one.

In general, these bugs are typically southern—in fact—Neotropical—and distinctly American. Six, however, are very widely spread—*Mormidea lugens, Hymenarcys nervosa, Solubea pugnax, Euthochtha galeator, Lygaeus kalmii* and *Zelus exsanguis.*

I sometimes wonder that more attention is not paid to insects as key-forms in the theory of evolution. It is true that an elephant has more bulk and is not so likely to get lost or lose a leg, but elephants are not so abundant in numbers or in individuals as insects. On the other hand, a sufficiently large series of species of insects shows more variation; and, perhaps better, the course of variation. By their distribution, also, one may come to some confirmatory evidence in regard to the ancient land-masses and their connections. On the other hand, it may be urged that insects migrate great distances in the upper air; or on bits of wood floating on the ocean. But surely, the variation of species and their abundance in given regions can clearly show what is their metropolis and probably their point of origin.

At any rate, it would seem as though in insects one has keys to faunal affinities, on the one hand; and on the other, the evidences of nascent and vanishing species.

A CONTRIBUTION TO THE KNOWLEDGE OF THE BIONOMICS OF BREMUS VAGANS (F. SM.) (HYMENOPTERA).

By Theodore H. Frison, Illinois State Natural History Survey, Urbana, Illinois.

A. Introduction.

The present paper is the fourth of a series of papers dealing with the biology of species of bumblebees found in Illinois. In the first paper (1928), the prominent facts in the life history of *Bremus bimaculatus* (Cress.) were recorded in detail. In a second paper (1929b) similar information was published relating to *B. impatiens* (Cress.), and a third paper concerning *B. americanorum* (Fabr.) is now in press. For details regarding how much of the data used in this paper were obtained, the reader should consult my previous papers, particularly that relating to *B. bimaculatus.*

B. Systematic Notes.

Bremus vagans (F. Sm.) belongs to the subgenus *Pratobombus* Vogt (1911); a subgenus of bumblebees ranging through the Palaearctic, Oriental, Nearctic and northern part of the Neotropical faunal realms. In addition to being the most widely distributed subgenus of bumblebees, this subgenus contains more species than any other subgenus and is readily divisible into several subordinate complexes. In North America, *B. vagans* is most closely related to such species as *flavifrons* (Cress.) and *centralis* (Cress.) which have the tips of the sagittae of the genitalia conspicuously dilated, the hypopygium somewhat carinate, and with a long malar space. *Pratobombus,* together with the subgenus *Terrestribombus* Vogt (1911), form a section of bumblebees designated by Krüger (1917) as *Anodontobombus.*

This study of the biology of *B. vagans* conclusively shows that the forms of *Pratobombus* occurring in Illinois, and recognized as species by the writer, are biologically distinct unities; thus, confirming their separation into species on the basis of certain structural characters.

In Illinois, *B. vagans* is abundant in the northern part of the state, less common in the central part, and virtually absent in southern Illinois. It ranges in North America through the lower limits of the boreal zone of Merriam from British Columbia to

Maine, throughout the transitional zone, and in the central and eastern portions of the upper austral zone.

C. Specific Life History Studies.

The writer has examined two nests of this species started by queens under natural conditions and studied in detail one colony which was founded by a queen in an artificial nest.

1. *Experiment 19, 1919.*

This experiment was started on June 8, 1919, with two queens of *B. vagans* which were collected at Antioch, Illinois, on June 4, 1919. Previous to placing the queens in an artificial nest, they were kept under conditions intended to cause them to become "broody." The next day after placing the queens in the nest I found one of them dead; presumably killed by the living queen. Another queen of the same species was introduced into the nest-box on June 10, and on the following day one of them showed a special interest in the pollen lump. Egg cells were constructed on June 11 and eggs laid during the next few days. On June 18, there was every indication that larvae were now in the cells, and on June 19, I actually saw them. The larvae grew very rapidly and by the twenty-first of June several of them had attained considerable size.

During this early period in the development of the comb, both of the queens took a great interest in the comb, but it was evident that one of them—the largest queen—"ruled" supreme. The colony had progressed so nicely by June 22 that a record of the developmental stages was begun. On this date several new egg cells were found on the tops of recently spun cocoons. An examination of these cells showed that there were not more than two eggs in each of them. On July 1, normal workers emerged and three more came out during the next few days. On July 5, the smaller queen was removed from the box and the nest left to the care of the larger queen.

The comb continued to grow and on July 20 two more workers emerged. Previous to this date, new egg cells were laid from time to time. Two of the cells examined on July 16 contained four eggs each. These cells were laid contiguous to one another in a horizontal position. The workers were allowed the privilege of foraging for nectar and pollen on July 21. As the nest grew in size additional honey-pots were constructed of wax and pollen on the edge of the comb. Several of these cells averaged fifteen millimeters in height by eight millimeters in breadth.

By August 1 the number of workers in the nest had increased to twelve. At this date there was some surplus of pollen which was stored in empty cocoons. No surplus of honey, however, was found in the nest. It is interesting to note that the queen had now become so interested in the comb that she could not be induced to leave the comb while I examined the cells. Such was not the case, however, with the workers which were ready to use their stings at every opportunity. On August 9, another worker emerged and it was noted that nearly twenty-four hours were required for her pubescence to attain its normal color. On this same date many egg cells were in evidence on the tops of cocoons and in the depressions between them. The egg cells were made as usual from wax and pollen. On the side of the comb nearest the entrance to the nest-box, the bees had built up a protecting shield of wax-pollen composition. Another one of their performances during the early part of August was the dragging into the nest-box from the outside a large amount of oat-chaff.

During the remainder of August, the comb continued to grow unretarded and the colony attained considerable size. On August 17, there were fourteen cocoons in the nest, about sixty larvae in various stages of development, and many eggs. The number of eggs in a cell varied from three to six. For the first time, too, in the history of this colony, a surplus of honey was found in the nest on this latter date. This was stored in large wax-pollen honey-pots on the outer margin of the comb, whereas most of the pollen was stored in renovated cocoons from which workers had emerged. The old mother queen was still producing wax and I frequently saw her scraping it from the dorsum of her abdomen. Only ten workers were in the nest when it was examined on August 17, but many others were foraging in the field. The first males were found in the nest on September 4 and emerged from cocoons which contained pupae on August 22. Workers were also found in the nest on September 4, which had but recently emerged. When the nest was next examined on September 16, two young queens, fourteen workers and ten males were found. The old mother queen was still active and looked almost as sleek and trim as when her first eggs were laid. Two new egg cells were present on cocoons, one of which contained eight eggs and the other nine. These eggs were contiguous and horizontal as before, but overlapped one another at one end. A queer find was an old sealed-over male cocoon, partially filled with pollen. This contained seven eggs which had been laid in an irregular manner. I am quite certain that these eggs were laid by workers. Many of the large larval cells plainly showed the presence of the small hole through which food was supplied them by the workers. Figure 1 shows the nest as it appeared on September 16.

On September 21, the old queen was alive and active as ever. The two young queens were still in the nest, besides fifteen males and ten workers. One worker was found dead in the nest box, but no trace of parasitism was found. Additional egg cells had been constructed and one of them contained seven eggs. The last week of September the old mother queen died. At this time there still remained in the nest about fifteen male and four queen cocoons from which the adults had not emerged. Because of the lateness of the season and cool nights, I moved the colony indoors so that other adults might emerge. From these cocoons two queens and four males emerged indoors as late as October 4. The males and queens produced by this colony were used in mating experiments (Frison, 1927a).

2. *Nest 23, 1916.*

At Hermon, New York, in 1916, I found a colony of *B. vagans* in the loft of a barn. The nest itself was in a cavity in a roof-joist, at a point where a side brace was joined to it. Evidently, the joint was so poorly constructed that mice had been able to enter the joist and gnaw out a cavity large enough for their nest. This place had then been found by a searching queen and adopted for her future home. The interesting feature of this nest was that a queen had been able to find this desirable location. In order for her to do so, it was necessary for her to enter the hay-loft of the barn through a small door. When once in the hay-loft, it must have required considerable searching on the part of the queen to find this nesting site, unless she was instinctively guided to the mouse nest by an olfactory sense.

When the nest was opened on August 18, it contained the old queen, twenty-eight workers, twenty males, four young queens, fifty-three cocoons containing pupae, six cocoons containing larvae, thirty-four empty cocoons, twenty-seven larvae in various stages of development, and five egg cells. Honey was stored both in large wax-pollen cells and in sixty-four renovated cocoons.

Pollen was found in four cocoons and in several of the large wax-pollen cells. One of these wax-pollen cells was three-fourths of an inch in height. The egg cells contained from six to fifteen eggs, the average number being over eleven. Two dead workers were found in the nest débris, but neither of them showed evidence of insect parasitism.

3. *Nest 1, 1920.*

This nest was found near Grand Marsh, Wisconsin, on August 21, 1920. The colony was located in a mouse nest at the base of a young cherry tree in a small orchard. The nest contained the old queen, four young queens, fourteen males, twelve workers, about fifty cocoons, nearly forty larvae in various stages of development and two egg cells. Honey was stored in empty cocoons and in special wax-pollen cells. Pollen was observed only in the renovated cocoons. No parasites or inquilines were found in this nest.

D. Biological Summary.

1. *Résumé of literature.*

The first record of the occurrence of a nest of this species of which I am aware is one by Putnam (1864), who mentions finding a nest of *B. vagans* at Warwick, Massachusetts, in the summer of 1862. This author says nothing concerning the habits of these bees or the contents of the nest, except that the nest was made in a deserted mouse nest. Packard (1864) says that the nest discovered by Putnam in 1862 contained thirty workers and that no special variation occurred among them except in the different shades of yellow.

Franklin (1913), the next to report the finding of a nest of *B. vagans,* records one situated on the surface of the ground in an open field in what apparently was originally a mouse nest. " It contained two queens, eight workers and two males and was taken in the day time of July 20, 1904. The workers of this nest were the most vicious and ready to sting of any with which I have had any experience." In the collection of the American Museum of Natural History, New York, is a nest of this species which Franklin says " was taken by Mr. Wm. Beutenmüller at Potato Knob in the Black Mountains of North Carolina (elevation 6,420 feet) about July 1, 1902. This nest was located in the hollow trunk of a standing mountain ash and it contained two queens and eight workers, but many bees escaped as it was taken in the day time."

This nest, also, was apparently originally a mouse nest and was made from dried grass.

The next reference of a biological nature concerning this species is by Jackson (1920), who gives data regarding the time of appearance of the various castes in the vicinity of Washington, D. C., and plants they were observed to visit. Beginning in 1922, Plath has published several papers of special importance. In the first of these (1922a), this writer records the finding of nests of *B. vagans* near Boston. "Two of these were surface nests, while the remaining four were subterrean." This same author says the largest nest that he examined contained the old queen, over seventy workers and many brood cells. Another colony contained the "old queen, about fifty workers, and several males" and a queen of *Psithyrus laboriosus.* Shortly after this (1922b) the presence of the social parasite, *Psithyrus laboriosus* (Fabr.) in the nests of *B. vagans* is mentioned again in greater detail and the behavior of its host under such conditions discussed.

In a third paper (1923), the successful rearing of the colonies of this species in artificial nests is recorded. The fact that queens of *B. vagans* do not enter hibernating quarters until August is mentioned by Plath (1924). At a later date (1925), the same author presents some evidence in support of the fact that the variety *citrinus* (F. Sm.) of *Psithyrus laboriosus* (Fabr.) is partial to the nests of *B. vagans* rather than the typical form of this social parasite. In two still more recent papers *B. vagans* is recorded as a non-pocket maker (1927a) and that the queens are the latest of the *Pratorum* group (=*Pratobombus*) of species to appear in spring in New England (1927b).

In several papers the writer has published facts regarding the biology of *B. vagans.* In one paper (1927a) was recorded the fact that queens and males of this species would mate under controlled conditions, in a second paper (1927b) reference was made to the variation in size of bumblebees of this species and explained upon the basis of trophogeny, and in a third paper (1927c) evidence was presented to show that *B. vagans* could be readily semidomesticated.

2. *Anthophilous habits.*

This bumblebee has been recorded as frequenting a large number of flowers and like all others thus far studied is polytropic. Most of the records of the flowers visited by this bumblebee have been listed by Lutz and Cockerell (1920), with the exception of those of Jackson (1920) which are as follows: *Pentstemon hirsuta, Arctium minus, Monarda fistulosa* and *Brassica juncea.*

3. *Duration of the developmental stadia.*

These deductions concerning the developmental stadia are based upon a tabulated record of forty-two detailed examinations of the comb in Experiment 19, 1919, between June 22 and October 4. The data were secured by methods described in a previous article (Frison, 1928). It should be mentioned here that my conclusions regarding the length of time required for the three developmental stadia are essentially in agreement with data presented for other species (*B. bimaculatus, B. impatiens* and *B. americanorum*).

The egg stage was found to be the shortest of the three developmental stadia and lasts approximately four and one-half days for queens, workers or males. The larval stage is variable within certain limits even in the same caste. Larvae which produced workers required between fourteen and nineteen days to complete their development. The workers produced the latter part of August required more time in the larval stage than those produced in July and correlated with this lengthening of this stage of development was an increase in the size of the workers. Queen larvae required a longer time to complete their development than did worker larvae and the males required at least as long a time as the workers and sometimes longer.

The pupal period of the workers varied between six and eight days. That of the queens was at least this long and there were some data indicating it might be longer. The male pupal period was not accurately determined, but available data show that it could not have been less than that of the workers and in all probability was longer.

My data show that the first workers which emerged in Experiment 19, 1919, required between nineteen and twenty-two days to complete their development. Workers which emerged in August required more than this amount of time and most of the records indicate a period of about thirty days. The queens certainly required a month or possibly more. The males required less time than did the queens to complete their immature development. Although my records for this species are much less complete than for *B. bimaculatus* (Frison, 1928), they are sufficient, however, to permit of the above approximations and clearly show that *B.*

vagans does not present any great deviation in regard to the duration of the developmental stages from *impatiens, bimaculatus,* and *americanorum.*

4. *Seasonal appearance of the castes.*

B. vagans is not sufficiently common in the vicinity of Urbana, Illinois, to permit of a close study of the appearance of the over-wintering queens in spring. The species, however, appears much later than either *B. bimaculatus* or *B. impatiens.* At Antioch, in northern Illinois, on June 3, 1919, queens of this species were very abundant.

Data on pinned queens in various collections corroborates a late appearance of the queens in spring in all parts of their range. Most of the queens from New Jersey and Pennsylvania in the collection of the Academy of Natural Sciences of Philadelphia and of the American Entomological Society were collected in the months of May and June. I have seen many queens in the same collection, collected in Northern Michigan (Barago County) by Mr. Morgan Hebard, which were captured from July 4 to July 20. I am certain, too, that these latter queens were ones that had over-wintered. There are a large number of queens of this species in the Nason Collection belonging to the Illinois State Natural History Survey which were collected at Algonquin, Illinois, in May and June. In Champaign County, Illinois, I have captured the queens in the latter part of June. The earliest record I have seen for a queen of this species is May 1, 1915. This specimen was collected by Mr. C. A. Frost at Sherborn, Massachusetts. No doubt in certain years the queens appear earlier than these records indicate, but it is quite evident that as a rule the queens appear considerably later than most, if not all, other queens of *Pratobombus* in central and eastern North America. Data by Plath (1927b) and Jackson (1920) confirm my conclusions about the seasonal adjustments of the queens of this species.

Because of the late appearance of the queens, the workers are encountered much later than those of certain other species. In Experiment 19, 1919, the first workers emerged on July 1. In the collection of the Illinois State Natural History Survey are two workers captured on July 9 and 13 at Urbana, Illinois. A study of a large series of specimens of this caste from various parts of its range shows that the workers are most commonly collected from the middle of July to the middle of September. I have seen workers collected in Maryland as late as October 6. Of course the appearance of the workers varies somewhat according to the lateness or earliness of the season and according to locality, but it is most influenced by the late appearance of the queens in spring.

The first males to appear in Experiment 19, 1919, emerged between the last of August and first of September. Males continued to emerge in this nest until the first part of October. The data obtained from the study of a very large series of males from various parts of the country show that the males are captured as a rule in August and September. Males occur much earlier than this, however, and I have taken them in 1920 as early as July 11, at New London, Wisconsin. Such early males may be the product of worker eggs in a nest which has lost its queen.

5. *Caste ratio.*

According to my studies and the figures given by Franklin and Plath, the workers outnumbered the young queens anywhere from three or seven to one. Apparently, as a rule, more males are produced than queens. In Experiment 19, 1919, nearly seven males were produced for every queen, and nearly as many males as workers. There are so many factors governing the numerical abundance of the various castes, that at the best these figures are but indications of what is generally encountered.

6. *Size of colonies.*

Judging by the records just given the colonies of this species never attain very large size compared with species such as *B. impatiens* or *B. americanorum*. Nest 23, 1916, is undoubtedly a good example of the colony of this species. Only seventy-three adults were found in the nest. Adding to this figure the number of workers probably foraging in the field when this nest was removed, and the adults that might have emerged later in the season (as indicated by cocoons and larvae), the colony could probably not have produced more than one hundred and seventy-five adults. If the colonies studied by Plath, Franklin and myself are truly representative, few colonies of *B. vagans* produce over one hundred and fifty adults.

7. *Variation.*

Franklin (1913) gives a table showing the variation in the length of the malar space of this species which represents considerable variation. In a recent paper (1929a) I have shown that the *vagans* and subspecies *sandersoni* of Franklin was a mixture of two species; *vagans* with a comparative long malar space and *frigidus* with a shorter malar space. Polymorphism in size, particularly in the females, is considerable and is due to trophogeny (Frison, 1927b). Although this species is fairly constant in color characters there are variations which merit recognition. Males were produced in Experiment 19, 1919, which had some ferruginous pubescence at the apex of the abdomen and specimens about like these have been named by Bequaert and Plath (1925) as variety *coctus*. Specimens with the apical abdominal segments yellowish instead of black are common and have been assigned the varietal name of *helenae* by the writer (1929). Both the varieties *coctus* and *helenae* occur in the same nest with typical specimens of *vagans* and hence are merely color varieties. Recently the writer (1929a) has reduced the form *bolsteri* Franklin from specific rank to the status of a subspecies of *vagans*. This is because no structural characters exist for the separation of *bolsteri* from *vagans* and it seems that *bolsteri* is a color form of *vagans* " farther along nature's path to species than a form differing but slightly in color characters from the typical species." *Bolsteri* seems to be endemic to Newfoundland where typical *vagans* is not known to occur.

8. *Cocoons and food storage.*

It was found that both pollen and honey were stored in cocoons from which the adults have emerged. Special wax-pollen cells are also constructed, usually on the edge of the comb, for the storage of honey and pollen and in Experiment 19, 1919, most of the honey was stored in these wax-pollen cells. In Nest 23, 1916, however, which contained a large honey surplus, it was mostly stored in renovated cocoons. Several wax-pollen storage pots in Experiment 19, 1919, were fifteen millimeters in height by seven millimeters in breadth. The cocoons when freed of wax and pollen usually have a pale yellow appearance and are thin in comparison with those of certain other species such as *B. americanorum*. One worker cocoon was ten millimeters in height and eight millimeters at its greatest diameter.

In agreement with *B. bimaculatus* and *B. impatiens,* both members of the subgenus *Pratobombus,* this species belongs to the " Pollen-storer " section in the terminology of Sladen (1912) which is equivalent to the *Anodontobombus* Krüger as now restricted.

9. *Mating.*

There are no records in the literature concerning the mating habits of this species. Young queens produced in Experiment 19, 1919, readily mated with males from the same colony under controlled conditions during the last of September and early part of October (Frison, 1927a). Undoubtedly under natural conditions copulation takes place in late summer and fall.

10. *Nest situations.*

The queens of *B. vagans* will apparently nest almost any place where a suitable protected situation can be found, either below or above the surface of the ground. The nests of mice offer both desirable nesting materials and favorable nesting sites and hence are usually utilized by the queens in spring. Reference has already been made in this article under a heading of "Résumé of literature" to locations of nests reported by Franklin, Putnam and Plath and will not be repeated here.

11. *Miscellaneous.*

The workers of this species are aggressive and this species must be listed as vicious compared with such a docile species as *B. auricomus* (Frison, 1918).

Records have already been published by the writer (1926) showing that the larvae of *B. vagans* are subject to the attacks of *Brachycoma sarcophagina* (Townsend), that the adult queens are sometimes infested with the nematode *Spherularia bombi* Dufour, the nest damaged by larvae of *Vitula edmandsii* (Packard), and that various scavengers may lodge within the nests. No doubt other parasites, such as *Physocephala* will be found to attack *B. vagans.* Among the social-parasites, or *Psithyrus,* Plath (1922b) has found that *B. vagans* is victimized by *P. labbriosus.*

12. *Domestication.*

Experiments of Plath (1923) and those of my own performed in 1919 demonstrate that queens of this species may be readily induced to start colonies under controlled conditions. Since the males and females mate under controlled conditions (Frison, 1927a), this species may be semi-domesticated. Because *vagans* has a wide distribution, a long malar space permitting the workers legitimate access to many flowers, a fairly long seasonal adjustment, and may be semi-domesticated, this species opens up possibilities to the laboratory worker and is a fit subject for economic exploitation.

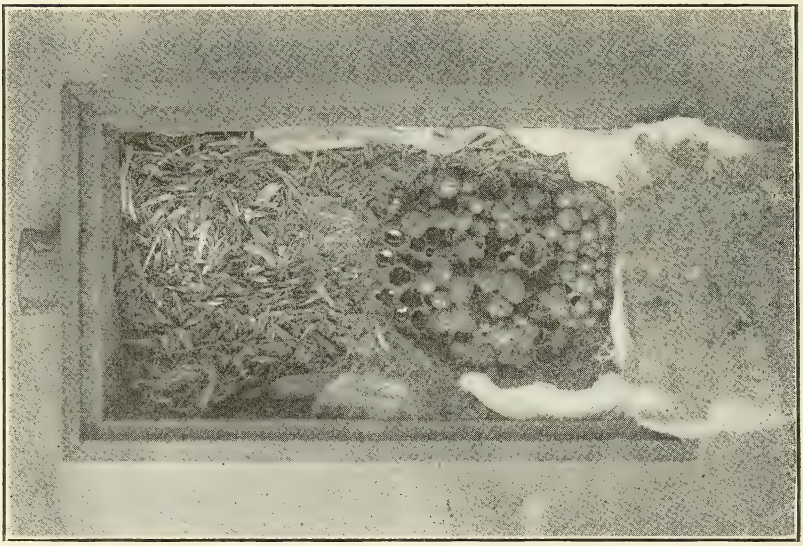

FIGURE 1. Comb of *Bremus vagans* in a small observation box, showing chaff "carded" into box by the adults in order to cover comb, and mother queen. September 16.

E. BIBLIOGRAPHY.

In order to conserve space, references in this article identical with those cited in my paper relating to *Bremus impatiens*, published in a recent number of this same journal, are not repeated and readers interested are referred to this recent paper for additional bibliographic material.

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Nesting habits of Isodontia, a subgenus of Chlorion (Hymenoptera).—In the December, 1928, issue of this Bulletin, Mr. Geo. P. Engelhardt has an interesting account of the breeding habits of *Chlorion harrisi* Fernald, which he observed in Texas with Mr. H. B. Parks. Their observations show that the nesting of this wasp is unlike that of the majority of *Chlorion,* which dig their own burrows in the soil. It is, however, similar to that of *Chlorion auripes* Fernald (*tibialis* Lepeletier), as observed in the eastern United States by Angus and, more recently, by Phil and Nellie Rau; to that of *Chlorion elegans* (Smith), as described by Davidson in California, by C. N. Ainslie in North Dakota, and by S. A. Johnson in Colorado; and to that of the European *Chlorion splendidulum* (Costa), according to P. Marchal and H. Nicolas. These four species all agree in selecting pre-existing cavities for the storing of their prey, which consists of tree-crickets or katydids. The cavities may be old galleries made by carpenter-bees in wood, abandoned burrows of *Anthophora* in adobe, hollow reeds or plant stalks, or rolled up dry leaves. Inside the hollow, the several cells are separated by plugs of dry grass or other plant material. *Chlorion harrisi* has also been recorded by H. G. Hubbard and by F. M. Jones (under the name *Isodontia philadelphica*) as nesting in the pitchers of *Sarracenia flava.* Moreover, the four species mentioned belong, within the genus *Chlorion,* to a peculiar group, or subgenus, *Isodontia,* characterized *inter alia* by the absence of a tarsal comb of long spines on the fore legs of the female. The lack of a comb is evidently correlated with the aberrant nesting habits; for in the other groups of *Chlorion,* which dig burrows in the soil, the comb is strongly developed in the female.

From these considerations one is naturally led to the conclusion that all the fossorial wasps of the subgenus *Isodontia* will prove to have nesting habits similar to those of the four species discussed above. I am therefore pleased to record one more species of this group that strengthens this surmise. A short time ago I received from Mr. G. B. Fairchild a female of *Chlorion* (*Isodontia*) *exornatum* Fernald, obtained in Royal Palm State Park, southern Florida, during December, 1920. As Mr. Fairchild tells me, this wasp was captured while entering the hollow, broken stalk of a tall herbaceous plant, probably one of the Umbelliferae. —J. BEQUAERT, Boston, Massachusetts.

BOOK NOTES.

General Catalogue of the Hemiptera—Fascicle III—Pyrrhocoridae, by R. F. Hussey, with Bibliography by Elizabeth Sherman—pp. 1–144. (Published by Smith College, $1.50).

This Fascicle III reached our desk just as we had gone to press for our February number, too late for inclusion in our commentary on Fascicle II.

Dr. Hussey has produced in this what is probably the most complete and finished catalogue of any Family of the Heteroptera, whatever we may think of the form in which it appears. It is an invaluable work of reference; and no serious student of the Heteroptera can consider his library adequate without it.

In the present state of knowledge of the family (we trust soon to be enlarged and improved by Dr. Hussey), the arrangement of genera in the Fascicle is in systematic order as near as may be, within the subfamilies and tribes; but the order of the species is strictly alphabetical. Accordingly, collections of Pyrrhocoridae will have to be arranged specifically according to the latest monographs (if any); or to the owner's best critical knowledge. The tribes—Euryophthalmini and Physopelltini—are new; and three new names are proposed—a remarkable self-restraint in an author working with a group so little known. Dr. Hussey's study of the Family shows that the subfamily Euryophthalminae genitalically is near the Family Lygaeidae; while the subfamily Pyrrhocorinae shows distinct evidence of relationship with the Coreidae. These findings set the Family Pyrrhocoridae definitely between the Lygaeidae and the Coreidae.

Forty-three genera containing 361 species are in the family. Lethierry and Severin, in 1894, gave a total of 33 genera and 272 species. This is an increase of over 1/3 in both categories in the intervening 36 years.

All references and citations are arranged according to date, under family, subfamilies, genera and species. Within the genera, all synonyms are arranged alphabetically in the same series as the valid species, in addition to the complete synonymy under each species, in its proper place.

There are three appendices: A—genera wrongly included in the Pyrrhocoridae; B—list of pyrrhocorid species described under generic names now assigned to other families and their present nomenclature; and C—list of species transferred by various authors to genera other than those in which they appear in the Catalogue.

The Bibliography, which is very extensive, was prepared by Miss Elizabeth Sherman. It covers pp. 114–137. The Index is arranged according to genera and higher groups; and species.

The editorial eye brings realization that proof-reading of foreign languages as set by American typesetters, is a ticklish, unchancy and unsatisfactory business at best. Meantime, one also remembers the vengeful wish "Would that mine enemy would write a book," against the day of requital.

All in all, this fascicle continues the high standard set by the first to appear; and despite any minor shortcomings which might reveal themselves on a critical survey, it is at this writing easily the best general catalogue of any family of the Heteroptera. No institutional library of biology can afford to be without it; and it is indispensable to the serious worker in Heteroptera, however restricted his specialty. J. R. T.-B.

N. B.—These remarks are dissociated from the reviewer's function as one of the Board of Editors; and are completely realistic and objective.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXV June, 1930 No. 3

TRICHOPTERA FROM CAPE BRETON, NOVA SCOTIA.

By Nathan Banks, Cambridge, Mass.

During the past two summers Mr. Graham Fairchild has collected a number of caddice flies on Cape Breton, Nova Scotia. Among them are several that are new, and others of which I have rarely received specimens. Most of the species were described by Francis Walker, who had material from the southern part of Nova Scotia.

Besides the 31 species recorded, there is a female of the genus *Lype,* a genus not before recorded from America, but well known in Europe.

Phryganeidae.

Neuronia postica Walk.

Two from Baddeck, 4, 8 July.

Neuronia pardalis Walk.

One from Baddeck, 7 July. A rather small light-colored specimen, the hind wings partly light on basal portion; we have a similar specimen from Anticosti.

Neuronia concatenata Walk.

Several specimens from Baddeck, 12, and 29 July, and Pt. Bevis, 10 July.

Phryganea cinerea Walk.

From Pt. Bevis, 10 July.

Limnephilidae.

Arctoecia consocia Walk.

One from Baddeck, 9 Aug.

Glyphotaelius hostilis Hag.

From Baddeck, 14, 15, and 24 July.

Anabolia bimaculata Walk.
One from Baddeck, July.
Limnephilus combinatus Walk.
Several from Baddeck, 8, 17 July, 9 Aug.
Limnephilus ornatus Bks.
From Baddeck, 21 July, 1, 9, 13 Aug., and Ingonish, 7 Aug.
Limnephilus moestus Bks.
From Baddeck, 8, 10, 11, 12 July; Pt. Bevis, 10 July.
Limnephilus submonilifer Walk.
Many from Baddeck, 1, 3, and 14 Sept.
Platycentropus maculipennis Kol.
From Baddeck, 3 Sept.
Pycnopsyche scabripennis Rbr.
From Cape North, 1 Aug., also Englishtown.
Pycnopsyche guttifer Hag.
Two from Baddeck, 20 July, 14 Sept.
Caborius punctatissimus Walk.
From Baddeck, 3 Sept.
Anisogamus modestus Bks.
Four from Baddeck, 8 July.
Anisogamus divergens Walk.
Many from Baddeck, 11 Aug., 4 Sept.
Drusus sparsus Bks.
Several from Baddeck, 5, 8 July.
Hylepsyche indistinctus Walk.

One from Baddeck, 18 July; a very pale specimen 14 Sept.; both males with inner apical spur of hind tibia enlarged. A female from N. Sidney (Noble coll.) also has the spurs enlarged, but genitalia appear different.

Neophylax ornatus Bks.

A female from Baddeck, 8 July; a male from Middle River, 11 July. The male is marked much as female, but the pale is more broken by dark, so that in some of the pale cells or forks there are dark cross-bands.

SERICOSTOMATIDAE.

Alepomyia bryanti Bks.

A number of specimens from Pt. Bevis, 10 July, agree with types from Grand Lake, Newfoundland.

Mormomyia vernalis Bks.

One male from Baddeck, 4 Sept., with the characteristic long tufts of hair overhanging the genitalia.

Arcadopsyche gen. nov.

A Sericostomatid in the section of *Crunoecia.* Antennae widely separate at base, basal joint greatly elongate and enlarged, near tip curved downward, densely clothed with mostly erect, long hair. Vertex with a tuft of long hair each side from a tubercle near the eye; palpi (of male) recurved, densely clothed with long-stalked scales, forming a great mask over face; spurs 2, 4, 4. In fore wings the costal area is very broad, the discal cell slender, forks 1, 2, and 5, fifth connected beyond the forking to branch of medius; anal vein does not connect out to fork 5; the second anal (or axillary) runs into anal long before tip. In hind-wings the venation is similar to *Crunoecia,* but discal cell closed and smaller, and the apparent fork 3 not as wide at tip.

Related to *Olemira* by palpi and antennae, and with very similar venation in both wings, but lacks scales on fore wings, and the reflexed costal area.

Arcadopsyche prominens sp. nov.

Scales of palpi gray, iridescent and rather bluish at tips; hair on basal joint of antennae mostly deep black, but some white, beyond the antenna is pale, narrowly annulate with dark; vertex with mostly gray, but some black hair; thorax with mostly black hair; abdomen black toward tip, pale on base and beneath; legs pale, tibiae and tarsi darker outside. Wings fumose, with darker veins; short hair mostly yellowish, but some dark, large black patch just behind end of discal cell, smaller patches in area beyond, and some along anal margin; outer fringe largely black, but some patches of pale hair. Hind wings fumose, with darker fringe. Discal cell nearly as long as pedicel, lower branch of medius and fork 5 equally far basad, long cross-vein from fork 5 to branch of medius, very short cross-vein from anal to cubitus, and placed much before base of discal cell. Expanse 19 mm.

From Cape North, Cape Breton, Nova Scotia, 7 August.

LEPTOCERIDAE.

Œcetina micans Hag.

From Pt. Bevis, 10 July; also darker specimens from Baddeck, 20 July. Probably the same as *inconspicua* Walk. Walker's type is rather larger, and I have not seen specimens from as far south.

RHYACOPHILIDAE.

Rhyacophila atrata Bks.

From Middle River, 11 July.

Rhyacophila luctuosa Bks.

From Baddeck, 6 July, and North River, 13 July. Probably the same as Walker's *invaria.* From what I could see of the type the venation was the same, and the broad, emarginate superior process the same, but I could not see the shape of the apical part of the inferior appendage, but the length and size of inferior appendage was about the same as *luctuosa.*

Rhyacophila fairchildi sp. nov.

Head brown, with yellow and black hair; antennae mostly pale on basal part, beyond dark; palpi dark on apical part; lateral ocelli only about three diameters from the eyes; thorax with mostly yellow hair; legs pale, darker on front tibiae and tarsi, spurs dark; abdomen dark above, pale beneath, on upper sides with rather short, erect, pale hairs. Wings fuscous, stigma darker, clothed with short black hair, and many patches of golden hair, two large spots on anal margin; in apical half of wing the golden occupies most of the space; veins with long, erect black hair, some here and there golden. In fore-wings fork 2 is a little before fork 1, fork 3 scarcely as far basad as fork 1, cross-vein to radius close to fork 1; a rounded hyaline spot over forking of median vein. Expanse 14 mm.

From Baddeck, Cape Breton, Nova Scotia, 4 Sept.

HYDROPSYCHIDAE.

Hydropsyche indecisa Walk.

From Pt. Bevis, 10 July, and Baddeck, 31 July.

Dolophilus breviatus Bks.

One from Pt. Bevis, 10 July.

Plectrocnemia aureola sp. nov.

Face with dark hair below antennae, above mostly yellowish, but a tuft of black each side near eye; antennae pale, faintly annulate with brown; thorax with mostly yellow hair; abdomen dark above, pale beneath; legs pale yellowish, front tibiae and tarsi darker on outer side, spurs pale. Fore-wings with mostly golden or yellowish hair, some patches of dark, mostly along the veins and at their ends, larger dark spots near end of anal, and over connection from anal to cubitus.

Fore-wings fairly broad; fork 1 a little longer than its pedicel, fork 2 a trifle back on discal cell, fork 3 and 4 subequal, not near as far basad as fork 2, fork 5 broad, as wide before middle as at tip. In the hind-wings fork 1 shorter than pedicel, fork 2 back a little on discal cell, fork 5 very broad, broader before middle than at tip. Male appendages show a very broad ventral plate, emarginate in middle. Expanse 16 mm.

From Baddeck, Cape Breton, Nova Scotia, 20 July, and Hampton, N. H., 1 July (S. A. Shaw).

Plectrocnemia albipuncta sp. nov.

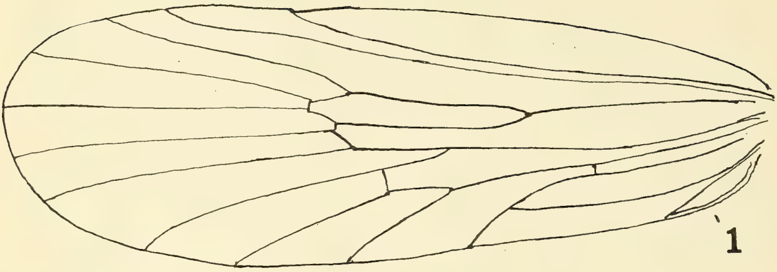
Below antennae mostly black hair, above mostly white, a large patch of black on each side on vertex, thorax with mostly black, but some patches of white hair; antennae brown, annulate with pale; legs pale, outer side of tibiae and mostly beyond dark, spurs dark on outer side, pale beneath; abdomen dark above, paler beneath.

Fore-wings black, with many white spots, largely grouped, some near base, others tending to form band near middle, others near stigma and below, a few near tip, but marginal fringe black, close to base of wing is some erect, black hair; hind-wings slightly fumose, darker on tips. Fore-wings rather narrow for the genus; fork 1 longer than its pedicel, fork 2 back to cross-vein, forks 3 and 4 subequal, but not as far basad as fork 2. In hind-wing discal cell faintly closed (except in one specimen), fork 1 three times as long as pedicel, fork 2 scarcely back on cell; male appendages show a large curved plate each side. Expanse 15 mm.

From Pt. Bevis, 10 Aug., and Baddeck, 9 Aug., Cape Breton, Nova Scotia.

Explanation of Plate.

Fig. 1. *Arcadopsyche prominens,* fore wing.
Fig. 2. *Plectrocnemia aureola,* genitalia, top.
Fig. 3. *Plectrocnemia aureola,* genitalia, side.
Fig. 4. *Rhyacophila fairchildi,* genitalia, side.
Fig. 5. *Plectrocnemia aureola,* ventral plate.
Fig. 6. *Plectrocnemia albipuncta,* genitalia, top.
Fig. 7. *Rhyacophila fairchildi,* genitalia, top.
Fig. 8. *Arcadopsyche prominens,* head and hair.
Fig. 9. *Plectrocnemia albipuncta,* genitalia, side.
Fig. 10. *Arcadopsyche prominens,* genitalia, side.



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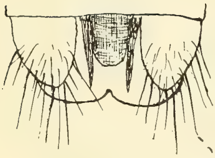

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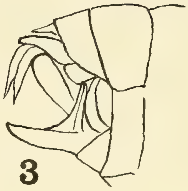

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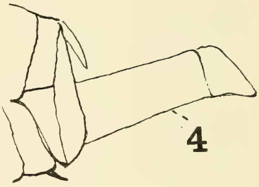

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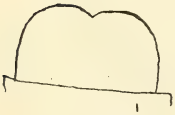

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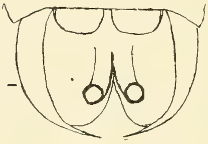

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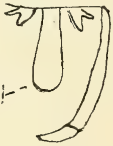

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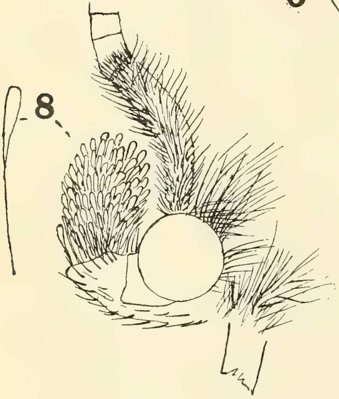

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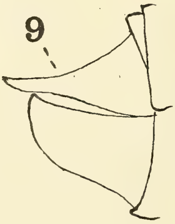

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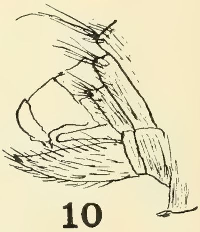

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PAPILIO MONUSTE LINNAEUS (A CRITIQUE).

By W. J. Holland, Pittsburgh, Pa.

I have been much interested in an article published in the Bulletin of the Hill Museum, Vol. III, No. 1, pp. 52–56, entitled: "The Identity of *Papilio monuste* Linné," presumably from the pen of Messrs. Joicey and Talbot. The authors identify *Pieris monuste* (Linné) with *Pieris cynis* Hewitson, consistently misspelling the specific name throughout their article as *"cycnis"* Hewitson. There is no Pierid bearing the specific name *"cycnis,"* so far as I can ascertain. The article is prompted by the query raised in 1879 by W. F. Kirby as to whether *monuste* has hitherto been correctly identified.

After a careful examination of all the literature and all the figures cited in the article I cannot agree with the conclusion that *Pieris monuste* (L.) was misidentified by Fabricius, the pupil of Linnaeus, and that it is identical with the insect named *P. cynis* by Hewitson.

I have critically compared the figure given by Kleemann with that given by Cramer and see no material difference between the two, except that the figure of the upper side of the insect given by Kleemann is decidedly better than the figure given by Cramer. Kleemann was a miniature painter of renown and his figures are exceedingly accurate, which cannot always be said for those of Cramer.

Cramer cites Kleemann's figure as being that of the same insect which he himself depicts as *monuste.* After a careful examination of the two figures and several hundreds of male specimens of what is known as *P. monuste,* I see no reason for thinking that Cramer was wrong in identifying the insect, which he figures, as being the same as that figured by Kleemann. I have hundreds of specimens of what are undoubtedly *P. monuste* ♂, some of which match Kleemann's figure, and many of which match neither of them. Even in these plain white things marked with black borders there is variety. Butler's statement (*Cf.* Cat. Fabr. Diurnal Lepidoptera, 1869, p. 199) puts the matter quite too strongly. In this I agree with the authors of the article I am reviewing.

The line of argument followed by my friends in seeking to reach their conclusion does not commend itself to my mind as being logical or even just.

They begin by attacking the competency of Fabricius as a witness in the case, when he under *monuste* cites Kleemann's figure. They say that Fabricius "obviously was writing from what he saw in Kleemann, and did not know the insect himself. There is therefore no question as to what Fabricius meant by his use of the name. He founded it on a figure without any proof that this figure represented the Linnaean insect, and no one can prove that this was not a misidentification. His whole conception of the Linnaean insect was obviously based on the Kleemann figure." To this statement I take exception as involving a *petitio principii.* Fabricius was a pupil of Linnaeus. He gives abundant evidence throughout his writings of thorough familiarity with the work of his teacher and friend. He knew the collections of Linnaeus, and was in a far better position to decide what Linnaeus intended under the name *monuste* than any one at the present day. His citation of Kleemann's figure does not by any necessity imply that he *"obviously was writing from what he saw in Kleemann, and did not know the insect himself."* This statement is a purely arbitrary assumption made by the writers, I fear without due respect for the learning and accomplishments of Fabricius.

I object even more strongly to the next point made in the argument of the writers. They say: "Cramer . . . figures an insect from a specimen, which thus becomes the type of his *monuste.* His reference to Kleemann was apparently copied from Fabricius. As the Cramer figure agrees much better with the Linnaean description than does the figure of Kleemann (note underside), we consider he has proved that the Fabricius determination was erroneous."

Cramer was not unacquainted with the literature of the subject upon which he wrote and published. In the Introduction to his great work he cites Kleemann among other authors, with whose writings he was familiar, and informs us that Kleemann was the son-in-law of M. August J. Rösel von Rosenhof, who after the death of his celebrated father-in-law took up and continued the work of illustrating the more beautiful exotic butterflies. The assertion made by the writers of the article that Cramer's "reference to Kleemann was apparently copied from Fabricius," is unjust to Cramer. Cramer knew his subject and ke knew the entire literature extant in his day. Any one who is careful to examine will see that he constantly makes reference to Kleemann's work throughout his own. In Vol. I of the Papilio Exot., p. 35, he cites Kleemann's figure of *P. oenone;* on p. 86 under *P. amphinome* he cites Kleemann's figure, and so on *passim* throughout his entire great work. He was not "copying Fabricius" and had no need to copy Fabricius. There is not a shadow of doubt that he was familiar with Kleemann's work and that it was before him, while he was carrying on his own. Cramer himself identifies the butterfly which he figures as being the same which was figured by Kleemann. Both representations particularly that of Kleemann are recognizable figures of the American insect *monuste.*

Linnaeus when describing *monuste* simply says "*Habitat in exteris* terris," which means that the specimen came to him *from parts unknown.* Kleemann's figure of course was that of an insect from Dutch Guiana, where *monuste* abounds. Cramer says that the insect is found in China, but *Pieris* (*Phrissura*) *cynis* Hewitson, which Joicey and Talbot try to make out to be what Cramer figured, does not occur in China, but in regions further south, Sumatra, Borneo, and the Malay Peninsula. Cramer was undoubtedly mistaken in assigning China as the habitat of his insect.

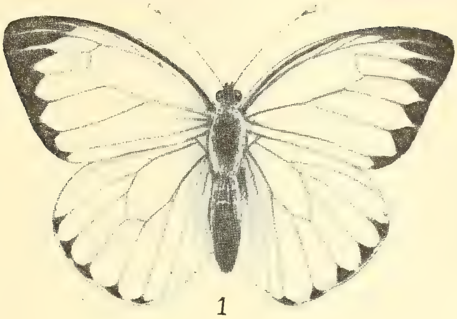
It is difficult to conceive how the learned gentlemen, who have recently favored us with their views upon this subject, can by any possibility have confounded the *monuste* of Fabricius, Kleemann, and Cramer, with *Phrissura cynis* (Hewitson), or how they can imagine that Linnaeus' description fits the latter species. *P. cynis* is well figured by Hewitson, Exot. Butt., Pieris, Pl. VIII, fig. 54, (not P. VII as cited by Joicey and Talbot), by Butler, Trans. Ent. Soc. London, 1871, Pl. VII, fig. 1, and by Distant, Rhop. Malayana, Pl. XXVI, figs. 5 and 6. It is also well figured by Seitz, Vol. 9, Pl. 62. c. We have an abundance of material representing the species from Sumatra, the type-locality, and from the Malay Peninsula. The argument given by the learned authors of the article, which I am reveiwing, strikes me as extremely labored and the conclusion pre-eminently unsatisfactory.

I shall persist in applying the specific name *monuste* to the well known neotropical species, and the name *cynis* to the equally well known oriental insect. They are wholly distinct. The Sumatran insect may at once readily be distinguished from the American *monuste* by the different form of the wings, its smaller size, the wide black costal margin and the broad black apical area and by the entire dissimilarity of the female from any form of *monuste,*

♀, ever found. The two insects are totally different, and I cannot imagine how the singular conclusion has been reached by my learned friends, that Linnaeus' description fits the Sumatran insect. It fits the American insect far better than the Sumatran. With all due respect to the "Father of Natural History," his descriptions of butterflies in many cases are hardly worth the paper upon which they are printed. We honor him for starting the good work of classification, and pointing out the lines along which it should be carried; but a great deal of paper and time is being wasted in recent years in attempting laboriously to decide that what he named was something else than what all his followers have up to the present time accepted as being the species indicated by him.

The name proposed for the American insect by Messrs. Joicey and Talbot, *phileta* Fabricius, is that of a melanic variety, common in American collections, in which the upper surface is pale brownish gray.

I am sorry to differ from friends, but in this case I cannot fail to do so, having regard to what I think is the truth of things.



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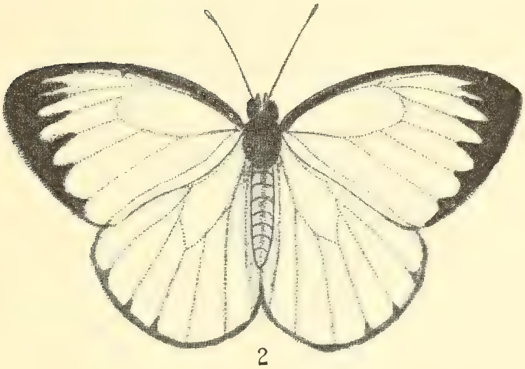

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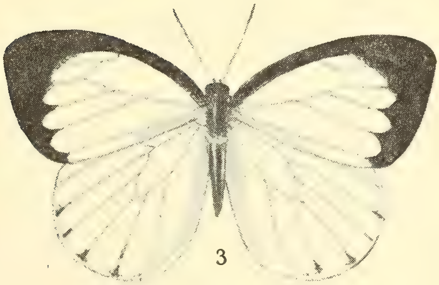

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A REPORT ON THE NOMENCLATURE OF SOME NEOTROPICAL NOTONECTA WITH THE DESCRIPTION OF SOME NEW SPECIES.

By H. B. Hungerford, Department of Entomology, University of Kansas.

An examination of the types and historical materials in various European Museums makes necessary certain changes in the nomenclature of some of the American Notonecta. The confusion of species in the past has led to errors in synonomy and to a misconception of the faunal distribution of certain species. Thus in Kirkaldy and Torre-Bueno's Catalogue of American Aquatic and Semi-aquatic Hemiptera (1909) we find the distribution of *Notonecta undulata* Say which is a North American species given as "All over Canada and the United States; Mexico; Cuba; Jamaica; Columbia; Peru; Chile." The above was based, doubtless, on the conception of the species by the senior author who had monographed the Notonecta of the world (1897). In the above named catalogue we find the following statement of synonymy:

Notonecta undulata Say 1832.
=*americana* Gmelin 1789.
=*scutellaris* Fieb. (in part) 1852.
=*punctata* Fieb. (in part) 1852.
=*variabilis* Fieb. (in part) 1852.
=*pallipes* Fieb. 1852.
=*maculata* Fieb. 1852.
=*unicolor* Fieb. 1852.
=*virescens* Blanchard 1852.
=*pallipes* Lethierry 1881.

Mr. Kirkaldy's conception of this species was just as confused as his treatment of *Notonecta glauca* Linn. has been shown to be by Delcourt and others or his inexplainable inclusion of his *Notonecta kiangsis* as a variety of *Notonecta chinensis* Fallou! The assumption that Kirkaldy had a reasonable understanding of specific identity led to the description of this *Notonecta kiangsis* Kirkaldy erroneously as new by both Professor Esaki and me. We described it almost simultaneously under the names *Notonecta bergrothi* Esaki and *Notonecta suensoni* Hungerford from specimens from China which had come into our hands. Both of us have since seen the specimens in the Paris Museum bearing the locality labels as published by Kirkaldy and treated by him as a variety of *Notonecta chinensis* and recognized the synonymy of our names. For my part, however, I was unable to explain how any one of Kirkaldy's experience could have done it until I saw the type of *Notonecta virescens* Blanchard and recalled that Kirkaldy considered it under *Notonecta undulata* Say. *Notonecta virescens* Blanchard is a small species described from Chile, South America, and belongs to that group of small South American Notonecta in which I have described several species. There is a larger species in Chile, of which I have several hundred specimens, that in Kirkaldy's day, might with some justification have been confused with *Notonecta undulata* Say merely because of its size. From the description and drawing of *Notonecta fazi* sp. n. given below it will be seen that it is specifically distinct from *Notonecta undulata* Say. I have not seen any South American specimen of Say's species. Neither have I seen it from the Antilles. It occurs throughout North America but is replaced more and more as one goes south[1] by a species with a broad black band across the hemelytra which has been known to us in recent years as *Notonecta howardii* Bueno. This is the species which comes to our collections in such numbers from the Islands of the Antilles. It is *Notonecta indica* Linnaeus. Sometimes one finds specimens with the scutellum margined with yellow—such, unfortunately, is the specimen in the Linnean collection in London. This had resulted in confusing this species with another which has a flavous margin on the scutellum and a similar black band across the hemelytra, the species to which we have been giving the name *Notonecta indica* and which is common in the Southwestern part of the United States and in Mexico. It is readily separated from the true *Notonecta indica* Linn. by the shape of the mesotrochanter which is angulate. (In *Notonecta indica* Linn. = *Notonecta howardii* Bueno the mesotrochanter is rounded). It is *Notonecta unifasciata* Guérin—the type of which I have seen in the Paris Museum. The three species of black and white Notonecta in the United States should therefore be known by the following names:

---

[1] I have it from North Carolina, S. Carolina, Tennessee, Florida, Georgia, Mississippi, Louisiana, Texas, Arizona, New Mexico, California, Mexico, Colombia in South America, Cuba, Jamaica, St. Thomas, St. Croix and Porto Rica.

Notonecta undulata Say widely distributed and varying from nearly white forms to some that are very dark.

Notonecta indica Linn. 1771.

═ *Notonecta americana* Fabr. 1775.

═ *Notonecta howardii* Bueno 1905 *et al.* including myself—Southern U. S., insular America, Mexico and Columbia.

Notonecta unifasciata Guérin.

═ *Notonecta indica* of Kirkaldy *et al.* including myself —Southwestern U. S. and Mexico.

One sometimes finds pale forms of any of the above labeled *Notonecta variabilis* Fieb. This species does not occur in North America but until recent years *Notonecta raleighii* Bueno and *Notonecta lunata* Hungerford have gone by that name.

Doctor Kirkaldy in his first paper on the "Revision of the Notonectidae" 1897 treated *Notonecta bifasciata* Guérin as a valid species but in his "Ueber Notonectiden" 1904 unfortunately reported that *Notonecta bifasciata* Guérin and *Notonecta variabilis* Fieb. were only varieties of *Notonecta undulata* Say. Neither is related to Say's species.

An examination of the type of *Notonecta bifasciata* Guérin shows it to be a different species from the one I figured in Psyche Vol. XXXIII, Plate 2, Figure 5, 1926, which is probably *Notonecta sellata* Fieb. In the above named paper I figured two species which I then supposed had been described that I now know to be new.

Notonecta confusa sp. n.

(See Psyche Vol. XXXIII, Plate 2, Figure 6).

Size: Length 12. mm.; width of head 2.8 mm.; greatest width of thorax 4 mm.

Color: The color of this solitary specimen is pale yellow throughout. It may be the leucochromatic form of a dark species or merely teneral of a form colored as in *N. undulata* Say.

Structural characteristics: Size and general appearance might confuse this species with any of the *Notonecta undulata* Say group. Vertex : synthlipsis : : 2 : 1. The head and thorax shorter than in *N. indica* Linn. (*N. howardii* Bueno). The lateral margins of pronotum are straight. Trochanter hook on front leg of male about as in *N. undulata* Say. Mesotrochanter feebly angulate. Male genital clasper (as shown in citation above) readily separates this species from *N. undulata* Say. Described from a single male specimen from "S. Amer." Type in the P. R. Uhler collection in U. S. National Museum, Washington, D. C.

Notonecta distinctoidea sp. n.

(See Psyche Vol. XXXIII, Plate 2, Fig. 8).

Size: 10.8 to 12. mm. long; width of head 2.9 mm.; greatest width of thorax 4.35 mm.

Color: General facies dark. Head, anterior part of pronotum and legs pale yellow to horn. Face, legs and lateral margin of abdominal venter more or less marked with paris green. Scutellum black. Hemelytra purplish black save two oblique tan streaks near base of corium and clavus, and tip of membrane which is pale.

Structural characteristics: While the color description might apply to *Notonecta indicoidea* Hungerford this is a plumper species—both deeper in body and broader across the humeri, with a male genital clasper of quite different shape. Head not prominent. Vertex: synthlipsis: : 13 : 6. Pronotum strongly convex, rear margin and scutellum much higher than the head. Mesotrochanter rounded. Male genital capsule and clasper as shown in citation above.

Described from three specimens, all males from Mexico labeled as follows: 1st. specimen; "Mexique" "Museum Paris" coll. Noualhier 1898. 2nd. specimen, "Museum Paris, Mexique Etat de Jalisco, L. Diguet 1900." 3rd. specimen, "Mexique W. H. Ashm." "Corixa mexican N. S." "*Notonecta americana* Fab. var. det. Kkldy. '97." This also bears my labels "H. B. H. No. 226 Genitalia" and "Europ. trip 1928 H. B. Hungerford."

This third specimen is stained and misshappen and I therefore make the first named specimen the type and Paris Museum its depository.

Comparative notes: In comparing this species with *Notonecta indicoidea* it may be noted that the species is plumper of body, more like my *Notonecta distincta,* from which it differs in shape of head and in lacking the basal protuberance of the anterior trochanter of the male.

Notonecta fazi sp. n.

Size: Length 12 mm.; width of head 3.3 mm.; greatest width of thorax 4 mm. Males a little smaller.

Color: General facies dark. Head, anterior part of pronotum and legs pale yellow. Scutellum black. Hemelytra, reddish brown to black marked with tan. Membrane dark sometimes with a pale spot in distal half, sometimes with the tips pale instead. The tan markings are variable, typically as follows = on base of clavus and extending as indefinite streak near the outer margin to near its tip. A small area near base of corium sometimes lacking—another of various form in outer half of corium sometimes but not usually reaching membrane.

Structural characteristics: The short truncate head and the shape of the male genital claspers distinguish this species structurally from others of the same size. Anterior and mesotrochanters as in *N. undulata.* The male genital clasper shaped like a boot with the heel to the rear. Capsule rather elongate.

Described from several hundred specimens from Chile, South America, and were most kindly presented to me by Doctor Alfredo Faz, in whose honor I name the species. Some are labeled "Limache," some "Santiago" and others "Termas Cauquenes." The holotypes, allotype and paratypes are in the University of Kansas Collection. Some paratypes will be sent to U. S. National Museum and to Mr. J. R. de la Torre-Bueno. I was quite surprised to find so few examples of this species in the European Museums.

In the Deutsches Entomologische Museum, Berlin-Dahlem:
1 ♀ "Peru" "Coll. Breddin."
1 ♂ "Valdevia, Chamelcha." "Coll. Breddin." This was det. *N. undulata* Say by Kirkaldy 1899.
In the Paris Museum:
1 ♂ "Museum Paris Chili Valparaiso R. Martin 1922."
In the Berlin Museum: 13 spec. "Fundort."

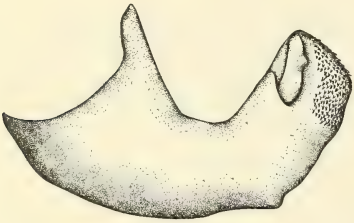


Fig. 1
N. fazi sp. new.

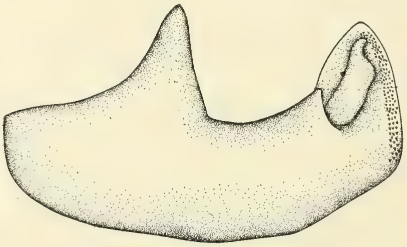


Fig. 2
N. verveertbruggheni Hungerford.

Genital capsules of males.

Fortunately it has been possible to recognize the specimens that Doctor Kirkaldy studied and even where his conception of a species had been very vague it will be possible to reassign his insects to their proper species, thus correcting misconceptions of distribution and relationships. This work has been accomplished and will be reported in my review of the genus Notonecta.

DR. WILLIAM BARNES.

By George P. Engelhardt, Brooklyn, N. Y.

The death of Dr. William Barnes, of Decatur, Ill., on May 1st, at the age of seventy, was announced at the meeting of the Brooklyn Entomological Society on May 15 and received with deepfelt regret. A life member of long standing, Dr. Barnes often timed his visits to the east so as to connect with the entomological sessions in Brooklyn, where he was assured of a hearty welcome by his many friends and the members one and all. His presence always gave rise to intense enthusiastic discussions, mainly on the North American Lepidoptera, a subject on which he was an internationally recognized authority.

Only those who have been privileged to visit Dr. Barnes at Decatur, Ill., can have an adequate idea of the size, composition and scientific importance of his collection. Housed in a separate building of fire-proof construction, the main collection is placed in oak cabinets of some 1200 drawers, while reserve and exchange material is contained in 2000 or more so-called "Schmidt" boxes arranged on shelves on the wall. Type specimens, including Holotypes, Paratypes, Homotypes, etc., are represented to the number of nearly 7000. Five hundred thousand would seem a conservative estimate as to the total number of specimens in the Barnes collection. To assemble such a collection has been the work of a life time of indefatigable labor and unstinted expense. Himself an enthusiastic worker in the field, Dr. Barnes also supported most liberally experienced collectors and dealers in Lepidoptera in all parts of the country and usually on terms which gave him the first choice on the seasons captures or receipts. Nearly every species in the Barnes collection has been finally determined by comparison with the original type wherever located, over here or abroad. By purchase he acquired in toto or in part the collections of Taylor, Doll, Kearfott, Field, Merrick, Poling, Hill, Longley, Spaulding, and many others. Of the famous Oberthuer collection he secured all the North American Lepidoptera excepting the Sphingidae, Parnassius and Hesperidae.

As assistants in the upkeep and development of his collection, Dr. Barnes employed for a number of years, successively, Dr. J. H. McDunnough, Dr. F. H. Lindsey and Mr. F. H. Benjamin, all trained entomologists of outstanding ability and accomplishments. The Barnes Library, particularly as it applies to North American Lepidoptera, is excelled hardly by any other in this country.

To the fame of Dr. Barnes as the owner of the largest and most important private collection of North American Lepidoptera must be added his renown as one of the foremost surgeons in the state of Illinois. His graduation from the Harvard Medical School in 1886 was followed by a several years' sojourn in Europe resulting in post-graduate courses at the Universities of Heidelberg and Paris and a proficiency in the German and French languages. Returning to Decatur, Ill., he became one of the founders and prime associates of the famous Decatur and Macon County Hospital, an institution to which in 1920 he deeded the proceeds to be derived from the sale of his collection upon his death.

The Barnes collection and Library are now for sale. It is inconceivable that they should be allowed to leave this country. Let every entomologist join in the effort to secure it for a leading home institution where it will be in safe-keeping, accessible to all and stand as a lasting monument to the man who made it, Dr. William Barnes.

Ceratocombus vagans McA. & Mall. in Westchester County, N. Y.—The sole record for the State of New York of this minute hemipteron is that in List of Insects of New York, from Keene Valley. On May 31st last Mr. H. G. Barber and myself collected the little species in the White Plains city watershed. In a woodland by a swamp he sifted some 12 specimens in the course of about one hour, both long and short winged individuals. They were secured as usual in the upper layer of leaf mold below the undecayed dried leaves. This is the second record from the State; and goes to show that the bug has a quite extensive distribution.—J. R. DE LA TORRE-BUENO, White Plains, N. Y.

A WRONGLY IDENTIFIED AMERICAN WATER-STRIDER.

By C. J. Drake and H. M. Harris, Ames, Iowa.

Through the kindness of Mr. J. R. de la Torre-Bueno the writers have received European specimens of *Gerris rufoscutellatus* Latreille, some of which were determined as such by the late Dr. A. L. Montandon. A comparison of these specimens with examples of our common eastern gerrid determined heretofore as *G. rufoscutellatus* shows our species to be quite distinct and unnamed. The writers propose the name of *Gerris dissortis* for this common American water-strider. Published records of *G. rufoscutellatus* in this country should be referred to *G. notabilis* Drake and Hottes and *G. dissortis,* n. sp. In general the distribution of these two insects is throughout the northern portion of the United States and extends into Canada. In the case of the former the range is largely western, the species occurring as far eastward as Iowa. On the other hand *G. dissortis* is an eastern species whose habitat reaches west to the Rocky Mountain region, the range of the two species thus overlapping in the midwestern states west of the Mississippi River.

Gerris dissortis n. sp.

Size, form, color and markings very similar to *G. rufoscutellatus* Latr. but readily separated from it by the plump first genital segment of the male which lacks a distinct keel. In *G. rufoscutellatus* the first genital segment is strongly, transversely, depressed at the base and possesses a prominent median keel on the apical portion, on each side of which there is a strongly depressed area giving the terminal portion of the segment a somewhat pinched appearance. The first genital of the male of *notabilis* is quite similar to that of *dissortis* but differs in having the apex almost truncate (Ohio Jl. Sci. Vol. 28, 1928, p. 271, fig. 1, f and d.).

Legs much shorter than in *G. notabilis;* body as a rule considerably shorter and less robust, spines at the end of connexivum slenderer than in that species. Male genital segment slenderer; antennae proportionally shorter. Female generally slightly larger than male with a little shorter legs.

Length, 12–14 mm.; width, 1.6–2.00 mm.

Holotype, male, Tiffin, Ohio, Aug. 26, 1916, C. J. Drake, collector and *allotype,* female, taken with type, both in Drake collection. *Paratypes,* thirty specimens from Ohio, Illinois, Iowa, New York and Eastern Canada, in the collections of Iowa State College, U. S. National Museum, Canadian National Collection, J. R. de la Torre-Bueno and the writers.

This species in its western limits closely approaches *G. notabilis* in size of body, length of legs, and general appearance, but as pointed out by Drake and Hottes (Ohio Journal Science, 25: p. 46, 1923) it seems best to treat the two forms as distinct. Both species are known to occur only in the macropterous form. The writers have not seen specimens of the true *G. rufoscutellatus* from America.

Anthaxia aeneogaster Cast.—The first specimen of this species I have ever taken in this locality was found on the flowers of *Amelanchier* on May 4, 1930, in Acton, Mass. Near by was a stand of white pines.—C. A. Frost, Framingham, Mass.

Seeking a Better Climate.—An example of the transportation of insects by interstate commerce is probably presented by the appearance of a fresh specimen of *Myochrous longulus* Lec. on the floor of our front room the other evening; April 15, 1930. So far as I know it is a native of Arizona and Southern California and I have three specimens labelled "Yuma, Cal." It may have made the journey here in lettuce, shipments of which are said to come from that region at this time of the year..

While I would not go so far as to assert that the insect was seeking a better climate, we may, perhaps, expect deductions along this line by some future expert on insect psychology.—C. A. Frost, Framingham, Mass.

DIURNAL LEPIDOPTERA FROM WYOMING AND COLORADO.

Distribution, Life Zone and Habitat Notes—New Subspecies.

By Alexander B. Klots, Ithaca, N. Y.

Introduction.
Localities—descriptions and abbreviations used.
List of species and data.
List of Life Zones with characteristic species.
Figures.

Introduction.

The present paper represents an effort to make available some data gathered by the author on collecting trips in Wyoming and Colorado. These data are rather heterogeneous, but of a kind which will probably prove of value to taxonomic and ecological workers.

To the field naturalist and the ecologist a mere knowledge of the name of the food-plant and the appearance of the early stages of a species represent only a part of what should be known about the life history of that species. In the case of a large proportion of the species of Rocky Mountain diurnals even this little, however, is still unknown. The author has therefore considered it worth while to include many notes on habitat and local distribution, although such information will be of little value to the majority of present-day collectors. The student of the future, however, who cannot spend all his time in frantically searching for something to name because everything that possibly could be named will have been by that time, and who therefore will probably concentrate on biology and ecology just as mammalogists are doing now, will probably find such information valuable.

It is surprising how few published records are available for determining accurately the exact ranges of most of our insects. For Wyoming especially the writer has been able to find practically no data of this kind, yet Wyoming presents far more interesting distributional problems than most of the States. In the East the Great Plains area enters the state; in the Southeast the Medicine Bow Range of Colorado extends as far north as Elk Mountian, bringing with it a distinct fauna; in the Southwest the Great Basin fauna enters, both along the Uinta Mountains and in the Red Desert; and in the North a very distinct fauna extends down from

Montana. Yet with all these very different faunas entering the state and mingling, Wyoming is entomologically one of the least known areas in the country.

Very little work has been done in the Rocky Mountains in checking insect distribution with the Life Zone work done by the Biological Survey. In an attempt to do something of this sort the writer has tried to analyze the different localities collected and thus to gain some idea of the Life Zone ranges of the species taken. The records here included must, of course, be regarded as merely a small beginning of such a study, and are not intended to be in any way conclusive. It is hoped that they may prove suggestive of what can be done in this field, and be of use in the future as well.

In Life Zone Work it is, of course, almost impossible to establish hard and fast boundaries between the Zones. There is much overlapping of Zones, for reasons that vary with each locality. In the mountains a study of Life Zones is largely a study of "vertical distribution," but many other very important elements must be considered. Steepness of the mountains, quality of soil, amount of water available, exposure to sunlight and prevailing winds, early or late melting of snow, and many other such factors must be considered both individually and together.

The occurrence of the food-plant is of course the most essential factor in determining the distribution of Lepidoptera. Many other factors undoubtedly play a large part, and can be learned only by careful and detailed study of habitat and local distribution data.

The Life Zones of Colorado and Wyoming and their flora and vertebrate fauna have been extensively studied by the Biological Survey. The fundamental works on this subject are: Cary, Merritt. Life Zone Investigations in Wyoming. North American Fauna No. 42, 1917; and, a Biological survey of Colorado. North American Fauna No. 33, 1911. In these will be found detailed information which it would be superfluous to repeat here.

LOCALITIES.

The following are localities where collections were made. To avoid much useless repetition abbreviations have been used for these in giving records in the species list, as shown below.

Bellevue = Bellevue, Larimer Cy., Colo. Alt. 5200 ft. Collecting in arid grassy fields, in a few irrigated fields, and along a small creek bottom. Upper Sonoran Zone, with Transition Zone elements.

Brooklyn = Brooklyn Lake, Snowy Range west of Centennial, Wyo. Alt. 10500 to 11000 ft. Barren, windswept upland plateau with many small lakes, stunted spruces in irregular patches and low Alpine vegetation. Typical Hudsonian Zone.

Centennial = Centennial, Wyo. Alt. 8000 ft. Collecting in arid sagebrush flats east of town and in marshy bottom of Little Laramie River. Transition Zone.

Foxpark = Foxpark, Wyo. Alt. 8500 ft. Collecting in grassy meadows, along roads and on sagebrush flats at lower edge of coniferous forest. Lower Canadian Zone with Transition Zone elements.

Libby = Libby Lodge about 2 miles west of Centennial, Wyo. Alt. 8500 ft. Collecting in grassy meadows and along road in lower portion of Canadian Zone coniferous forest. Lower Canadian Zone with a few Transition Zone elements.

Moose = Moose P. O., Jackson Hole, Wyo. A considerable area was intensively collected, containing a number of very different habitat zones. The vertical distribution is very marked, three Life Zones being noted within a horizontal distance of six miles.

TRANSITION ZONE.

Bottoms. In the Snake River bottom (alt. 6600 ft.) and extending up the bottom of its tributary Cottonwood Creek the fauna and flora are dominantly Transition. Thick growths of *Salix* are found on the gravel bars. Heavy groves of narrow leaved cottonwood (*Populus angustifolia*) occur, shading a luxuriant undergrowth. There are occasional areas of grassy marsh, and a few grassy meadows, where homesteaders have irrigated fields. Even in the bottoms, however, Canadian Zone elements are found, mostly plainly marked by growths of quaking aspen (*Populus tremuloides*).

Flats. The floor of the valley (alt. 6600–6800 ft.) is mostly level, arid flats, where sagebrush (*Artemisia tridentata* and *trifida*) are the dominant plants. The flats are dominantly Transition Zone, but there is a considerable mixture of Canadian Zone species, especially in the more grassy areas along the border of the coniferous forest. The steep slopes by which the flats descend to the river and creek bottoms show not only a marked concentration of the normal flats species but also a few species that are not found elsewhere in nearly such abundance.

CANADIAN ZONE.

Forest. The most typical Canadian Zone area is the broad belt of coniferous forest which extends from the sagebrush flats up the mountains to an elevation of 9,500–10,000 ft. Along its lower edge the forest fauna is considerably diluted with Transition species, especially in grassy meadows. A few species appear to be characteristic of the forest proper. Along its upper edge the forest is much broken up by grassy meadows, growths of quaking aspen, and steep slopes unsuited for tree growth. The lower portion of the forest is dominantly Lodgepole Pine (*Pinus murrayana*) with a mixture of blue spruce (*Picea parryana*), while in the upper portion Engelmann spruce (*Picea engelmanni*) becomes dominant. The upper border of the Zone is much obscured and mixed with Hudsonian Zone elements, owing to peculiar features of the landscape such as the steepness of the mountains, the occurrence of heavy "slides" in the Spring, and the scanty soil on many rocks buttresses. As an example of this mixture, the writer has taken the Pika (*Ochotona* sp.), a typical Hudsonian Zone mammal, in Bradley Canyon at 9000 ft. elevation, in the same place as *Plebeius icarioides* and *Papilio rutulus,* normal Transition-Canadian Zone butterflies. In many places the Hudsonian Zone is almost entirely obliterated by the presence of perpendicular cliffs or extensive rock "slides."

Most of the Moose records can be taken as fairly indicative of the dates of emergence and periods of flight of the species. No attempt has been made to collect in other parts of Jackson Hole, although the writer is aware of the occurrence in the valley of species which he has not taken at Moose.

Poudre = 23 miles up Little South Poudre River Canyon from "The Forks." Alt. about 6500 ft. Collecting in grassy meadows and arid flats and along river banks. Transition Zone with Canadian Zone elements.

Red Desert = Red Desert, Wyo., on the Union Pacific R. R. west of Wamsutter. Arid Upper Sonoran Zone.

Red Feather = Red Feather Lakes, Larimer Cy., Colo. Alt. 82–8400 ft. Collecting in grassy meadows and fields along streams and roadsides. Scattered growth of *Pinus scopulorum* and *Pinus murrayana.* Lower Canadian Zone with strong Transition Zone elements.

Spring = Spring Canyon, west of Forth Collins, Colo. Alt. 52–5500 ft. Collecting in arid grassy foothills, with a few irrigated fields. Upper Sonoran Zone with Transition elements.

Univ. Camp. = University of Wyoming Summer Camp, Snowy Range west of Centennial, Wyo. Alt. 9600 ft. Grassy meadows at the upper edge of the Canadian Zone coniferous forest. Canadian Zone with Hudsonian Zone strays.

Virginia Dale = Virginia Dale, Larimer Cy., Colo. Grassy meadows with scattered *Pinus scopulorum.* Transition Zone.

LIST OF SPECIES AND DATA.

In recording the Life Zone records the occurrence of a Zone name in parentheses signifies that only weak elements of that zone were present in the locality where the specimens were taken.

The synonomy used throughout is that of Barnes and Benjamin, List of the Diurnal Lepidoptera of Boreal America north of Mexico. Bull. S. Cal. Acad. Sci. Jan. 1926. 25: 3–27. Numbers are prefixed to names as in this list.

7 *Papilio zelicaon* Luc. Foxpark vi–28–'29; Univ. Camp vii–1, 2, 5–'29. The specimen vii–5–'29 may be *P. bairdii* Luc. Found in open meadows and fields, and along roads.

Zones: (Upper Transition) Canadian (Lower Hudsonian).

15 *P. r. rutulus* Luc. Libby vi–26–'29, Foxpark vi–28–'29, Univ. Camp vii–2–'29, Moose v–20–'24 to middle of August or later. Within its range found almost everywhere except in thick coniferous forest. Often found sucking up moisture at muddy places.

Zones: Upper Transition, entire Canadian.

16 *P. multicaudata* Kirby. Moose vii–14–'29 to middle of August or later. In river bottoms and along edges of flats. I have never taken it in pure Canadian Zone.

Zones: Transition, (lower Canadian).

17 *P. eurymedon* Luc. Libby vi–26–'29, Foxpark vi–28–'29, Moose vi–12–'29 to middle of August or later. Mostly taken along trails and in meadows in coniferous forest, less frequently in river bottoms and along edges of flats. A female, Moose vii–12–'29 is of a yellow ground color, fully as deep as many *rutulus* males.

Zones: Upper Transition, entire Canadian.

25 *Parnassius clodius* Men. Moose vi–23–'24 to latter part of July. Moose specimens are a bit difficult to determine. They appear to be somewhat intermediate between *baldur* Edw. and *gallatinus* Stichel. One male matches perfectly with *gallatinus* as figured in Elrod, M. J., The butterflies of Montana, fig. 15, the plate from which Stichel described *gallatinus.* The species was taken mainly on the edges of the flats along the edges of the bottoms. It appears either to emerge earlier than *smintheus* or to become worn much more easily, for by the end of the first week in July only very much worn specimens of *clodius* are obtainable, while fresh *smintheus* continue to emerge until well into August.

Zones: Upper Transition, Canadian.

26 *P. smintheus* Dbldy. & Hew. Red Feather vi–19–'29, Poudre vi–20–'29, Foxpark vi–27 & 28–'29, Univ. Camp vii–6–'29, Moose vi–12–'24 to end of August. Specimens from Red Feather are most like *hermodur* Hy. Edw. but the female is lighter. Specimens from Poudre are much like *sayii* Edw. having a very light female and being larger. Only one specimen, a small dark male, was taken at Univ. Camp (alt. 9600 ft.). This agrees well with *hermodur.* The specimens from Foxpark and Moose appear to be intermediate between *sayii* and *magnus* Wright. The species swarms at Moose along the edges of the flats, favoring flowers of *Sedum* and *Saxifraga* (the food-plants) and paying little attention to the flowers of *Apocynum* and *Epilobium* which most of the other butterflies visit most eagerly.

Zones: Upper Transition, entire Canadian, lower Hudsonian.

33 *Ascia sisymbrii* (Bdv.) Moose v–16–'24 to middle of June. Appears to have only this early Spring brood, as I have never taken it later in the summer when the second brood of *A. occidentalis* is very common. On edges of the flats along the bottoms.

Zones: Upper Transition, lower Canadian.

34 *A. occidentalis* (Reak.) Bellevue vi–18–'29, Univ. Camp vi–29–'29 to vii–6–'29, Brooklyn vii–7 & 8–'29, Moose v–18–'24 (first brood), vi–29–'24, flies through August. First brood specimens at Moose are uniformly very dark beneath as in *calyce* (Edw.). Specimens of the second average much larger and lighter in coloring. In all the localities collected during July and August *calyce*—like specimens occurred constantly, although toward the end of the season the lighter forms predominated. These dark summer specimens, although often as deeply colored as first brood *calyce,* average larger. Conversely occasional specimens occur which strongly resemble typical *protodice.* In view of the dominance in numbers of typical *occidentalis,* with frequent intergrades to these *protodice*-like specimens, these specimens must be considered as merely light *occidentalis.* The species appears to favor flowers of *Saxifraga.* At Moose it was taken most commonly along the edges of the flats along the bottoms, but was found in small numbers almost everywhere. The species always prefers large open spaces.

Zones: Transition, Canadian, Hudsonian.

36 *A. napi* (L.) Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vi–29 to vii–6–'29. Moose v–1–'24 (first brood) vii–9–'24 (summer brood) to ix–2–'24 (incomplete third brood). All specimens taken appear to belong to race *napi pseudonapi* (B. & McD.) Summer specimens are much lighter beneath than specimens of the Spring brood, but are not nearly all as immaculate as *pallidissima* (B. & McD.) which appears to represent merely immaculate specimens of this brood, and not the entire brood. Often taken in shaded Cottonwood groves in the bottoms. Prefers damp environments.

Zones: Upper Transition, Canadian, lower Hudsonian.

40 *Euchloë creusa* (Dbldy. & Hew.) Moose v–20–'24 (one female). This is the only specimen I have taken in Colorado or Wyoming that can by appearance be referred to *creusa.* It is perfectly typical. All other specimens, many of them taken flying with this one, are *ausonides coloradensis,* although many of these show intergradation to the *creusa* condition. A definite means of separating *creusa* and *ausonides*

is badly needed. Moreover the life history differences between the two forms should be very carefully checked. I personally consider that they represent no more than color varieties within one species.

41 *E. ausonides coloradensis* (Hy. Edw.) Red Feather vi–19–'29, Libby vi–26–'29, Foxpark vi–28–'29, Univ. Camp vi–26 to vii–6–'29, Moose v–16–'24 to end of June. The species appears to prefer the flowers of *Saxifraga*. The majority of females show a marked yellow suffusion on the secondaries above. There is much variation in the extent of the black and green markings and the intensity of the pearly white ground color on the secondaries beneath. Early Spring specimens average considerably smaller in size than those emerging later in the year, and in every way strongly resemble *creusa*. At the University Camp this species fairly swarmed in large open meadows at the upper edge of the coniferous forest, but was never taken a short distance higher up in typical Hudsonian Zone.

Zones: Upper Transition, entire Canadian.

47 *Anthocharis sara julia* Edw. Red Feather vi–19–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vii–3 & 6–'29, Moose v–20–'24 to vii–29–'29. I have found this species, unlike *ausonides,* preferring small shaded glades in the forest. In Colorado and Wyoming all the females taken were the yellow form to which *stella* Edw. is probably applicable. High altitude specimens (Univ. Camp 9600 ft.) are quite constantly smaller than those from lower altitudes, and have the orange of the apex of the primaries lighter and the subapical black bar more or less diffused and often not broken. Some hair-splitters may consider this form worth a name. I do not, especially as all intergrades to the condition appear with ascending altitude. A male at Moose vii–29–'29 had evidently just emerged. Aside from this one specimen I have never seen any other evidence of a second brood there.

Zones: Upper Transition, Canadian.

58 *Eurymus m. meadii* (Edw.) Univ. Camp vii–5–'29 (one male), Brooklyn vii–6 to 8–'29. Very definitely a Hudsonian Zone species. The single male taken at the University Camp was evidently a windblown stray. I have not found this species so difficult to collect as some published accounts would

lead one to believe. It occurs in barren windswept areas at and above timberline. In a strong wind, which is usually present, the butterflies alight on the ground and invariably sit sidewise to the wind, which blows them so that they are nearly resting on their sides. They may then be easily stalked.

Zones: (Upper Canadian), Hudsonian.

61 *E. eurytheme* (Bdv.)

f. *amphidusa* (Bdv.) Red Feather vi–19 & 22–'29, Univ. Camp vii–2 to 6–'29.

f. *eriphyle* (Edw.) Moose vii–29–'29 & viii–2–'29.

gen. vern. *autumnalis* (Ckll.) Poudre vi–20–'29, Libby vi–26–'29, Centennial vi–27–'29, Foxpark vi–27 & 28–'29, Spring vi–18–'29, Univ. Camp vii–1 to vii–6–'29, Brooklyn vii–7–'29, Moose viii–9–'24.

The great amount of variation shown by the yellow forms of this species makes accurate identification somewhat difficult. Specimens of the Spring *autumnalis* brood intergrade freely to *eriphyle* and f. *eurytheme.* It is also practically impossible to lay down any hard and fast rules for separating *autumnalis* and *eriphyle* from *philodice* (Godt.). Specimens of *autumnalis* also frequently approach *scudderii* (Reak.) in appearance. The species favors large open spaces, being very seldom found in small glades in the forest. At the University Camp many females were taken ovipositing on *Astragalus alpinus,* in the large open meadows above the forest belt. At Moose there is a very definite Autumn brood of *autumnalis.*

Zones: Upper Sonoran, Transition, Canadian, lower Hudsonian.

67 *E. alexandra* (Edw.) Foxpark vi–27 & 28–'29. Quite common in open fields at the lower edge of the forest. Very fond of puddles along roads. One white female (*hatui* B. & Benj.?) was taken vi–27.

Zones: Upper Transition, lower Canadian.

68 *E. scudderii* (Reak.) Univ. Camp vii–6–'29, Moose vii–25 & 30–'29. The University Camp specimens appear to be typical *scudderii.* The Moose specimens are quite different. In both sexes the under side of the secondaries lacks the

greenish suffusion characteristic of *scudderii,* resembling rather that of *pelidne.* The female is fully as yellow above as the male, and strongly resembles a female *interior.* These specimens probably represent a form more or less intermediate between *scudderii, pelidne* and *interior,* which three forms are probably all conspecific. This may be *pelidne skinneri* Barnes.

85 *Danaus menippe* (Hbn.) Moose vi–12–'24. One specimen only.

106 *Coenonympha ochracea* Edw. Spring vi–18–'29, Red Feather vi–19–'29, Poudre vi–20–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vii–2–'29, Moose vi–17–'24 to middle of August. Prefers large open spaces.

Zones: Upper Sonoran, Transition, Canadian.

108 *C. haydenii* (Edw.) Moose vii–25 to viii–2–'29. Taken only in open meadows and hillsides above the main forest belt. A specimen was taken at 10,000 ft. up Bradley Canyon in Lower Hudsonian. The Moose specimens show considerable tendency to reduction of the submarginal ocelli on the secondaries beneath. In this they agree with specimens from Yellowstone Park, the type locality, but differ from specimens from further north in Montana.

Zones: Canadian, lower Hudsonian.

117 *Cercyonis oëtus* (Bdv.) Moose vii–12–'29 to end of August, Red Desert viii–6–'29, Virginia Dale viii–7–'29. The species is very common on sagebrush flats, where it is somewhat difficult to catch owing to its habit of flying close to the ground between clumps of brush. It also occurs in open spaces above the main forest belt.

Zones: Upper Sonoran, Transition, Canadian.

122 *Oeneis uhleri* (Reak.) Poudre vi–20–'29, one very poor specimen. This was in Upper Transition Zone with Canadian elements.

140 *Erebia epipsodea* Butl. Foxpark vi–28–'29, Univ. Camp vi–29–'29 to vii–6–'29. Only one specimen was taken at Foxpark. At University Camp the species did not become at all common until vii–3, so that these dates may be taken as fairly indicative of the time of emergence. Found in small glades in the forest, but most abundant in open meadows above the forest belt.

Zones: Canadian (lower Hudsonian).

149 *Euptoieta claudia* (Cram.) Brooklyn vii–2–'29. A very much worn specimen in typical Hudsonian Zone.

157 *Dryas aphrodite cypris* (Edw.) Spring vi–23–'29 (2 fresh males), Virginia Dale viii–7–'29 (2 fresh females).
Zones: Upper Sonoran, Transition.

161 *D. hesperis* (Edw.) Moose vii–9–'24 to end of August. Most of the specimens taken were either along the edges of shaded bottoms or else along trails in the coniferous forest. The adults appear to favor the flowers of a large Mint (*Monarda*?). There is a great deal of variation in the amount of silver on the underside, with all intergrades between unsilvered and fully silvered specimens.
Zones: Upper Transition, Canadian.

167 *D. hydaspe* (Bdv.) Moose vii–8–'29 and vii–27–'29, all worn specimens. All were along trails in the forest and in small open glades and favored flowers of Mint. The specimens appear to be most like *h. hydaspe*, but are not typical. In the present state of North American *Argynnis* no more can safely be said.
Zones: Canadian.

170 *D. nevadensis* (Edw.) Foxpark vi–27–'29, Moose vi–25–'24 through August. f. *meadii* (Edw.) Poudre v–20–'29. Many specimens taken at Moose are very much like *meadii*, which here evidently is no more than a color form. Many other Moose specimens are very much like *gallatini* McDunnough, some females being almost a pale cream color. Very common on open flats and meadows. Shows a strong partiality for the flowers of Dogbane (*Apocynum*). At Moose also occurs in open meadows above the forest.
Zones: Upper Transition, entire Canadian.

171 *D. edwardsii* (Reak.) Spring vi–23–'29, Foxpark vi–28–'29, Univ. Camp. vii–2 to 4–'29.
Zones: Upper Upper Sonoran, Transition, Canadian.

172 *D. platina* (Skin.) Moose vii–12–'29 to end of August. Swarms along the edges of the flats, being very fond of Dogbane flowers. It also occurs in open meadows above the main forest.
Zones: Upper Transition, entire Canadian.

173 *D. halcyone* (Edw.) Bellevue vi–18 & 21–'29, Spring vi–18 & 23–'29.
Zones: Upper Upper Sonoran, (lower Transition).

182 *D. montivaga* (Behr.) Moose vii–14–'29. One specimen, a fresh male, is possibly referable to this species. The basal portion of the secondary beneath is, however, a deeper more chocolate brown.

185 *D. eurynome* (Edw.) Univ. Camp vi–'29 to vii–6–'29. Brooklyn vii–7–'29, Moose vii–12–'29 to end of August.

f. *clio* (Edw.) Univ. Camp vii–1–'29, Moose, vii–17 & vii–23–'29.

Clio is here evidently a rare color form. One specimen has the silver only about half gone. Like *nevadensis* and *platina* the species is found very commonly on sagebrush flats and meadows, and prefers the flowers of Dogbane. Of the *Argynnis* taken at Moose *hesperis* and *hydaspe* may be said to form one group in similarity of habitat and action, while *nevadensis, platina* and *eurynome* form another and are almost always associated together.

Zones: Upper Transition, Canadian, Lower Hudsonian.

186 *Brenthis myrina* (Cram.) Moose vi–25–'24, vii–17–'29, viii–2–'29. Taken both in bottoms in the valley proper, and in the marsh at the head of Bradley Lake.

Zones: Upper Transition, Canadian.

194 *B. freija* (Thun.) Univ. Camp vi–26–'29 to vii–3–'29, Brooklyn, vii–7 & 8–'29. Uncommon in the meadows just above the main forest. Comparatively common in typical Hudsonian Zone. One specimen was contentedly sitting on a snowbank.

Zones: Upper Canadian, Hudsonian.

212 *Euphydryas editha* (Bdv.) Univ. Camp vi–29 to vii–5–'29. I cannot tell to what subspecies the specimens belong. According to Gunder (Pan-Pac. Ent. July 1929, 6: 1–8) they should be nearest to *montanus* McD. They do not appear to be so. Identification to species was made by examination of the male genitalia. I am unable to separate the females from those of the *anicia* form which was taken in the same locality. Very common in open meadows above the forest belt.

Zones: Upper Canadian.

221 *E. anicia* (Dbldy. & Hew.) Foxpark vi–27 & 28–'29, Univ. Camp vii–2 to 6–'29, Moose v–24–'24, vi–12–'24, vii–18–'29, viii–2–'29. These records are for males only, as explained above. The Moose specimens represent a distinct race from those from southeastern Wyoming. The Moose specimen

viii–2–'29 was a very fresh male that had evidently just emerged. The species appears to occur in much the same sort of habitat as *editha,* although it is worthy of note that no specimens of *editha* were taken at either Foxpark or Moose in Lower Canadian or Transition Zone.

Zones: Upper Transition, Canadian.

222 *E. gillettii* (Barnes). Moose vii–19–'29. In creek bottom.

Zones: Upper Transition.

227 *Lemonias acastus* (Edw.). Moose vii–1–'24 to end of July or later. Specimens were taken along the edges of creek bottoms in strong Transition localities, and also in small glades of the purely Canadian Zone forest.

Zones: Upper Transition, Canadian.

243 *L. pola* (Bdv.). Virginia Dale viii–7–'29. Common in grassy fields.

Zones: Transition.

251 *Phyciodes tharos pascoensis* Wright. Poudre vi–29–'29, Foxpark vi–27 & 28–'29, Moose vi–4–'24 (first brood), vii–9–'24 (second brood.) *Tharos* does not appear to extend as far up the mountains at Moose as does *camillus,* never being taken in any numbers in the purely Canadian Zone area. Especially common on flats along edges of bottoms, preferring flowers of *Apocynum* and *Epilobium.*

Zones: Transition, Lower Canadian.

254 *P. camillus* Edw. Red Feather vi–19–'29, Poudre vi–20–'29, Foxpark vi–27 & 28–'29, Univ. Camp vi–29 to vii–5–'29, Moose vii–12–'29 through August. Found throughout the entire Canadian Zone.

Zones: Transition, Canadian, possibly lower Hudsonian.

245 *P. ismeria* (Bdv. & Lec.). Poudre vi–20–'29, Bellevue vi–21–'29.

Zones: Upper Sonoran, Transition.

274 *Polygonia satyrus* (Edw.). Moose v–1–'24 (appearance of hibernators) viii–3–'24 (year's brood). Females show considerable tendency to a reduction of the subterminal markings as in f. *chrysoptera* Wright. A female was observed at Moose ovipositing on *Ribes,* v–20–'24. The egg hatched v–29. Most commonly taken in bottoms, but also occurs in coniferous forest.

Zones: Upper Transition, Canadian.

276 *P. hylas* (Edw.). Foxpark vi–28–'29 (hibernator) Moose vii–9–'24 (fresh specimen of year's brood?).

Zones: Upper Transition, Canadian.

277 *P. zephyrus* (Edw.). Red Feather vi–19–'29, Libby vi–26–'29, Univ. Camp vii–2–'29, Moose iv–22–'24. All the preceding records apply to hibernators.

Zones: Transition, Canadian.

280 *P. oreas* f. *oreas* (Edw.). Moose v–20–'24.

Zones: Upper Transition, Lower Canadian.

284 *Hamadryas milberti* (Godt.). Bellevue vi–21–'29, Univ. Camp vii–1–'29, Moose iv–7–'24 (appearance of hibernators), vii–12–'29 (year's brood). Specimens may be referred to f. *subpallida* Ckll. but are not all typical. Most common in bottoms, but occurs throughout entire Canadian.

Zones: Upper Sonoran, Transition, Canadian.

285 *H. antiopa* (L.). Moose iv–9–'24 (hibernators), viii–2–'24 (year's brood). Pupæ may be found under the eaves and window casings of almost every cabin in the valley that is located near willows. Most common in bottoms, but occurs throughout entire Canadian.

Zones: Upper Transition, Canadian.

288 *Cynthia cardui* (L.). Univ. Camp vii–1 to 5–'29, Moose v–1–'24. Relatively uncommon at Moose.

Zones: Upper Transition, Canadian.

289 *C. carye* (Hbn.). Moose vii–12 & vii–18–'29. Both are worn specimens and are the only records I have for the region.

Zones: Upper Transition, lower Canadian.

309 *Basilarchia weidemeyerii* (Edw.). Bellevue vi–21–'29, Spring vi–23–'29, Moose vii–1–'24 to end of August. Prefers shaded woods. Most common in bottoms, but often found in coniferous forest. An individual often has a number of definitely preferred perches and when frightened flies regularly from one of these to another. The Colorado specimens show a reduction in width of the white band, representing a transitional stage to *angustifascia* B. & McD.

Zones: Upper Sonoran, Transition, Canadian.

357 *Strymon melinus* Hbn. Poudre vi–20–'29.

Zones: Transition.

363 *S. titus* (Fabr.). Moose vii–23–'29 to middle of August or later. Both on flats along edges of bottoms and in forest

glades. Shows a strong preference for flowers of *Apocynum* and *Epilobium.*

Zones: Upper Transition, Canadian.

364 *S. acadica* (Edw.). Moose vii–29–'29 to middle of August. Both on flats along edges of bottoms and in forest glades.

Zones: Upper Transition, Canadian.

367 *S. sylvinus* (Bdv.). Moose vii–20–'29 to middle of August. In bottoms, on flats along edges of bottoms, and in forest glades.

Zones: Upper Transition, Canadian.

377 *Mitoura spinetorum* (Hew.). Libby vi–26–'29 (one female). In a grassy marsh surrounded by coniferous forest.

Zones: Lower Canadian.

384 *Incisalia augustinus* (Westw.). Poudre vi–20–'29. Two specimens very much worn.

Zones: Upper Transition.

392 *I. eryphon* (Bdv.). Red Feather vi–19–'29, Foxpark vi–27–'29, Moose v–12–'24. In small glades and along roadsides. Both the Red Feather and the Foxpark specimens showed a distinct preference for perching on gooseberry bushes.

Zones: Upper Transition, lower Canadian.

396 *Callophrys sheridani* (Edw.). Red Feather vi–20–'29 (very worn), Moose iv–30–'24 to middle of July. At Moose this species is exceedingly common in the early Spring, on the sagebrush flats. Moose specimens show more reduction of the markings beneath than in typical *sheridani,* but less than in *neoperplexa* B. & Benj.

Zones: Upper Transition, lower Canadian.

397 *C. apama homoperplexa* B. & Benj. Foxpark vi–27–'29, Centennial vi–28–'29, Moose v–20–'24 to end of July. On sagebrush flats.

Zones: Transition, lower Canadian.

400 **Satyrium fuliginosa semiluna** new subspecies (See Figs. 5 & 6).

Differs from *f. fuligiinosa* from California, the type locality, as follows:

Male (1) Upper side of wings grey tinged with brown; stigma light grey, conspicuous; fringes wide, very light grey tigned with brown.

(2) Under side of wings light brownish grey; spots at ends

of discal cells light grey, conspicuous; postmedial rows of spots large, well defined; all spots definitely pupiled with black except in some cases the two immediately below costa of the secondary; submarginal row of spots distinct on both wings.

Female (1) Upper side of both wings light greyish brown; fringes wide, very light grey faintly tinged with brown.

(2) Under side of wings as in male, somewhat lighter grey in color, especially on secondaries.

The race is characterized in general by the much greyer ground color of the wings above, and the greater development of the markings below. In this latter respect it may be considered as more primitive than *f. fuliginosa,* showing the ancestral pattern more distinctly. Females of *semiluna,* though greyer than males, are still distinctly less brown above than males of *f. fuliginosa.*

Holotype male—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–23–'29 deposited in American Museum of Natural History.

Allotype female—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–22–'29 deposited in American Museum of Natural History.

Paratype no. 1, male—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–31–'29 deposited in Carnegie Museum.

Paratype no. 2, female—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–23–'29 deposited in Carnegie Museum.

Paratype no. 3, male—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–27–'29 in author's collection.

Paratype no. 4, female—Half Moon Ranch, Moose P. O. Jackson Hole, Wyo. vii–27–'29 in author's collection.

I am much indebted to Mr. E. Irving Huntington and the American Museum of Natural History for the loan of California *fuliginosa* for comparison with *semiluna.*

Specimens were taken in irrigated fields and along the edge of the flats, just below the lower border of coniferous forest.

Zones: Upper Transition, lower Canadian.

408 *Lycaena editha* (Mead). Moose vii–6–'24 to middle of August. Common on sagebrush flats, especially along edges of bottoms.

Zones: Upper Transition, lower Canadian.

409 *L. thoë* (Guér.). Spring vi–23–'29. In irrigated field.
Zones: Upper Sonoran.

410 *L. mariposa* (Reak.). Moose vii–25–'29 to end of August. Taken only in small shaded glades in coniferous forest.
Zones: Canadian.

411 *L. nivalis* (Bdv.). Moose vi–25–'24 to middle of August. Mostly on flats, one specimen in meadow at Taggart Lake.
Zones: Upper Transition, Canadian.

412 *L. helloides* (Bdv.). Centennial vi–28–'29. Wet meadows in river bottom.

f. *florus* (Edw.). Moose vii–6–'24 through August. The great majority of the specimens are typical *florus,* but a number are very nearly as light in color as typical *helloides.* Mostly in shaded areas in creek and river bottoms.
Zones: Transition, (lower Canadian).

418 *L. rubidus* (Behr). Moose vii–29–'29. One male in wet meadow.
Zones: Upper Transition (Lower Canadian).

419 *L. heteronea* Bdv. Moose v–20–'24 through August. Very common on flats. More pugnacious than other species of the genus.
Zones: Upper Transition, lower Canadian.

L. heteronea gravenotata new subspecies (see Figs. 1–4). Differs from *h. heteronea* from California, the type locality, as follows:

Size: Larger, the average wing-spread (sum of length of primaries from base to apex) of holotype, allotype and 18 paratypes being 34 mm. as opposed to an average of 30 mm. for the specimens of *h. heteronea* examined.

Markings beneath: heavier and more distinct; the submarginal row of spots on both primaries and secondaries is nearly always complete, while in *h. heteronea* the spots below veins R_5 and M_1 of the primaries and nearly all of those of the secondaries are almost always absent; postmedial row of spots of both primaries and secondaries heavy, while in *h. heteronea* these spots are usually very small on the primaries and only faintly if at all indicated on the secondaries; discocellular and basal spots of both wings always present as shown in figures, clearly marked, while in *h. heteronea* these spots are much smaller, the basal ones of the secondaries being often absent.

Gunder (Ent. News. July 1925. 36: 194. Pl. V, fig. 1.) has applied the name *coloradensis* to an aberration of this race which is characterized by the fusion of the black spots beneath. If names applied to aberrations are considered as having any status in nomenclature *coloradensis* will have to be used as the race name and *gravenotata* for the normal form of this race. If aberrational names are considered as having no status in nomenclature *gravenotata* will be used as the race name. The subject of the status of sub-subspecific names will in the near future, it is hoped, be considered by the International Commission on Zoological Nomenclature and perhaps be ultimately settled.

Gravenotata appears to be limited to the Great Plains side of the Front Range in Colorado. Specimens from Fort Collins and Estes Park in Larimer County, and from Plainview in Jefferson County are all *gravenotata.* Those from Fort Collins and Estes Park are the most extreme. Specimens from Grant, Park County, and Tolland, Gilpin County, are more or less intermediate between *h. heteronea* and *h. gravenotata.* Specimens from Granby, Sulphur Springs, Tennessee Pass, Aspen, Cimarron and Ridgway are *h. heteronea* with light specimens resembling *h. clara.*

Of a series of 4 males and 2 females from Glenwood Springs, Garfield County, 3 males are *h. heteronea* while the other male and the 2 females are distinct. In the more distinct spotting beneath these specimens strongly resemble *gravenotata,* but the primaries appear to be relatively shorter, and the females possess a very distinct marginal row of orange brown lunules on the secondaries above. I am inclined to think that they may represent a distinct local form, but have insufficient data.

It is to be expected, in the case of a race as limited in range as *gravenotata* that not only will a certain amount of intergradation occur around the borders of the race's territory but also occasional specimens will be found even in the center of distribution which will not conform to type. It is only where extreme isolation is possible that a race may become so distinct that it will show no grading back to the ancestral form. In all other cases there will be found intergrades, so that the race must be considered as based, not on the characters as shown by one or two chance specimens, but upon the average of a series of specimens. It is certain that *gravenotata* is far from being completely isolated from *heteronea,* and so the occasional atypical specimens which occur even in the center of *gravenotata* territory (I have one perfectly typical *h. heteronea* from Fort Collins) need not be taken too seriously.

Holotype male and allotype female, Plainview, Jefferson County, Colo. alt. 6783 ft. vii–9–'27 and vii–12–'27 respectively, Collection E. I. Huntington No. 87, deposited by Mr. Huntington in American Museum of Natural History.

Paratype, males 1–9, Plainview, Colo. as above, Collection E. I. Huntington No. 87, vii–6 to 13–'27, in collection Mr. Huntington.

Paratype male 10, Spring Canyon, west of Fort Collins, Colo. alt. 52–5500 ft. vi–23–'29, in author's collection.

Paratype male 11, Estes Park, Colo. vii–15–'97, coll. by Emma Gillette, No. 2684 in collection Dep't. Entomology and Zoology, State Agricultural College, Fort Collins, Colo.

Paratype male 12, Estes Park, Colo. vii–20–'13, Acc. 4260 in coll. American Museum of Natural History.

Paratype females 13–15, Plainview, Colo. vii–10 to 12–'27, Coll. E. I. Huntington No. 87, in collection Mr. Huntington.

Paratype female 16, Plainview, Colo. vii–9 to 14–'22, alt. 7–8000 ft. Coll. E. I. Huntington No. 39, in coll. Mr. Huntington.

Paratype female 17, Estes Park, Colo. vii–16–'94, coll. by C. P. Gillette, No. 1734 in coll. Dep't. of Entomology and Zoology, State Agricultural College, Fort Collins, Colo.

Paratype female 18, Fort Collins, Colo. iv–25–'92, coll. by C. F. Baker, No. 317 in coll. Dep't. of Entomology and Zoology, State Agricultural College, Fort Collins, Colo.

The only specimen of *gravenotata* taken by the author, paratype 10, was in Upper Upper Sonoran Zone.

430 *Everes amyntula* (Bdv.). Bellevue vi–21–'29, Foxpark vi–27–'29.

Zones: Upper Upper Sonoran, Transition, lower Canadian.

432 *Plebeius melissa* (Edw.). Spring vi–18 & 23–'29, Poudre vi–20–'29, Bellevue vi–21–'29, Foxpark vi–27 & 28–'29, Moose vi–20–'24 to end of July. Dry meadows and flats.

Zones: Upper Upper Sonoran, Transition, lower Canadian.

434 *P. aquilo rustica* (Edw.). Red Feather vi–19 & 22–'29, Poudre vi–20–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vi–30 to vii–6–'29, Brooklyn vii–8–'29, Moose vii–15–'29. In grassy meadows and fields.

Zones: Upper Transition, Canadian, Hudsonian.

435 *P. s. saepiolus* (Bdv.). Spring vi–18–'29, Red Feather vi–19–'29, Libby vi–26–'29, Univ. Camp vi–29 to vii–6–'29, Brooklyn vii–8–'29, Moose vii–12 to vii–29–'29. In open grassy meadows and fields.

Zones: Upper Upper Sonoran, Transition, Canadian, Hudsonian.

438 *P. icarioides* (Bdv.). Spring vi–18–'29, Poudre vi–20–'29, Bellevue vi–21–'29, Red Feather vi–22–'29, Foxpark vi–27–'29, Univ. Camp vii–2 to 6–'29, Moose vii–6–'24 to middle of August. In grassy fields and meadows. Specimens from Colorado are referrable to race *lycea.* (Edw.). Those from Wyoming are nearest to race *pembina* (Edw.) but do not appear to be quite typical. Those from Moose are most like *pembina,* while those from Foxpark and Univ. Camp appear almost like transitionals between *pembina* and *ardea* (Edw.)

Zones: Upper Upper Sonoran, Transition, Canadian.

442 *P. a. acmon* (West & Hew.). Spring vi–18–'29, Poudre vi–20–'29, Foxpark vi–27–'29, Moose vi–20–'24 to the middle of August. Grassy meadows and sagebrush flats.

Zones: Upper Upper Sonoran, Transition, lower Canadian.

450 *P. enoptes ancilla* B. & McD. Spring vi–18–'29, Poudre vi–27–'29, Moose vii–12 to viii–2–'29. Identification to species was by examination of the male genitalia. The male specimens show a great deal of variation in size, width of the black border above, amount of orange at the anal angle of the secondaries above, and in the markings beneath.

Zones: Upper Upper Sonoran, Transition, (lower Canadian).

455 *Phaedrotes piasus* (Bdv.). Spring vi–18 & 23–'29.

Zones: Upper Upper Sonoran.

456 *Glaucopsyche lygdamus* (Dbldy.). Spring vi–18 & 23–'29, Red Feather vi–19–'29, Poudre vi–20–'29, Bellevue vi–21–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vi–29 to vii–6–'29, Moose v–20–'24 to middle of July.

Zones: Upper Upper Sonoran, Transition, Canadian, (lower Hudsonian).

458 *Lycaenopsis pseudargiolus* (Bdv. & Lec.). Univ. Camp vi–26 to vii–2–'29, Moose v–10–'24 to end of June. These specimens all appear to belong to *p. pseudargiolus.* Two females, Univ. Camp vi–26 & vii–2–'29 are f. *lucia* (Kirby).

The latter of these has the dark discal patch of the secondaries beneath very large, and the border of the same wing very heavily and broadly fuscous.

Zones: Upper Transition, Canadian.

For the identification of the following *Hesperiidae* I am indebted to the kindness of Messrs. F. E. Watson and E. L. Bell.

467 *Epargyreus tityrus* (Fabr.). Spring vi–18–'29.
Zones: Upper Upper Sonoran.

498 *Urbanus ruralis* (Bdv.). Red Feather vi–19–'29, Foxpark vi–27–'29. In dry grassy fields.
Zones: Upper Transition, lower Canadian.

503 *U. tessellata* (Scud.). Bellevue vi–18 & 21–'29, Spring vi–18–'29. In arid grassy fields.
Zones: Upper Upper Sonoran, (Transition).

513 *Pholisora catullus* (Fabr.). Bellevue vi–18 & 21–'29. Dry grassy fields.
Zones: Upper Upper Sonoran, (lower Transition).

523 *Erynnis icelus* (Scud. & Burg.). Moose v–24–'24 to end of June.
Zones: Upper Transition, (lower Canadian).

528 *E. p. persius* (Scud.). Red Feather vi–19–'29, Bellevue vi–21–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vii–5 & 6–'29, Moose vi–7–'24 to end of July. Grassy fields and meadows.
Zones: Upper Upper Sonoran, Transition, Canadian, (lower Hudsonian).

548 *Oarisma garita* (Reak.). Bellevue vi–18 & 21–'29, Spring vi–18 & 23–'29. Dry grassy fields.
Zones: Upper Upper Sonoran, (lower Transition).

560 *Hesperia uncas* Edw. Cheyenne Wells, Colo. viii–9–'29. Arid grassy prairie.
Zones: Upper Sonoran.

568 *H. comma colorado* (Scud.). Moose vii–9–'24 to end of August. Virginia Dale viii–7–'29. At Moose very abundant on sagebrush flats, also occurring, though uncommon, in meadows of Canadian Zone areas.
Zones: Transition, Canadian.

571 *H. viridis* (Edw.). Spring vi–18 & 23–'29. Arid grassy fields.

Zones: Upper Upper Sonoran, (lower Transition).

572 *H. nevada* (Scud.). Red Feather vi–19–'29, Foxpark vi–27 to 28–'29, grassy fields.

Zones: Upper Transition, lower Canadian.

583 *Ochlodes sylvanoides napa* (Edw.). Moose viii–3–'29. Common in grassy fields in river bottom, to which area it appears to be restricted.

Zones: Upper Transition, (lower Canadian).

589 *Polites manataaqua rhena* (Edw.). Bellevue vi–21–'29, Spring vi–23–'29. In arid grassy fields.

Zones: Upper Upper Sonoran, (lower Transition).

593 *P. mystic dacotah* (Edw.). Bellevue vi–21–'29. In grassy bottom of small creek.

Zones: Upper Upper Sonoran, (lower Transition).

595 *P. coras* (Cram.). Moose vii–15–'29 to middle of August. Found only in wet grassy marsh in river bottom, where it is very common.

Zones: Upper Transition, (lower Canadian).

597 *P. draco* (Edw.). Red Feather vi–19–'29, Libby vi–26–'29, Foxpark vi–27 & 28–'29, Univ. Camp vii–1 to 5–'29, Moose vi–13–'24 (one female, only record). Grassy fields and roadsides.

Zones: Upper Transition, Canadian.

605 *Atrytone vestris* (Bdv.). Bellevue vi–21–'29. Grassy fields.

Zones: Upper Upper Sonoran, (lower Transition).

LIST OF LIFE ZONES WITH CHARACTERISTIC SPECIES.

In the following lists an attempt has been made to list those species which appear to the writer to be sufficiently limited to one Life Zone so that they may be considered as characteristic of that zone. In the case of the majority of species this listing is not in the least conclusive in view of the extremely small amount of data available, and will probably not prove at all permanent. In the case of a few species, however, the listing is undoubtedly accurate. When a species has been taken in a zone or in zones other than the one which is considered to be its main center of distribution the initial letter or letters of the secondary zones are placed after the species name.

The placing of a zone in parentheses signifies that the occurrence of the species in that zone is comparatively uncommon or rare.

Many species have been omitted from the list, either because their zonal range is too great, or because the writer has insufficient data about them.

Upper Sonoran.

Urbanus tessellata T.
Oarisma garita
Hesperia uncas
Hesperia viridis
Dryas halcyone

Transition.

Papilio multicaudata U. S., (C.)
Dryas aphrodite cypris U. S.
Dryas nevadensis C.
Dryas platina C.
Brenthis myrina C.
Euphydryas gillettii
Phyciodes tharos pascoensis C.
Phyciodes ismeria U. S.
Basilarchia weidemeyeri U. S., C.
Strymon melinus
Strymon titus C.
Strymon acadica C.
Strymon sylvinus C.
Incisalia augustinus
Incisalia eryphon C.
Callophrys sheridani
Callophrys apama homoperplexa
Lycaena editha C.
Lycaena nivalis C.
Lycaena helloides (C.)
Lycaena heteronea U. S., (C.)
Plebeius melissa U. S., (C.)
Plebeius acmon U. S., C.
Philotes enoptes U. S., (C.)
Urbanus ruralis C.
Hesperia comma colorado C.
Hesperia nevada (C.)
Ochlodes sylvanoides napa (C.)
Polites coras (C.)

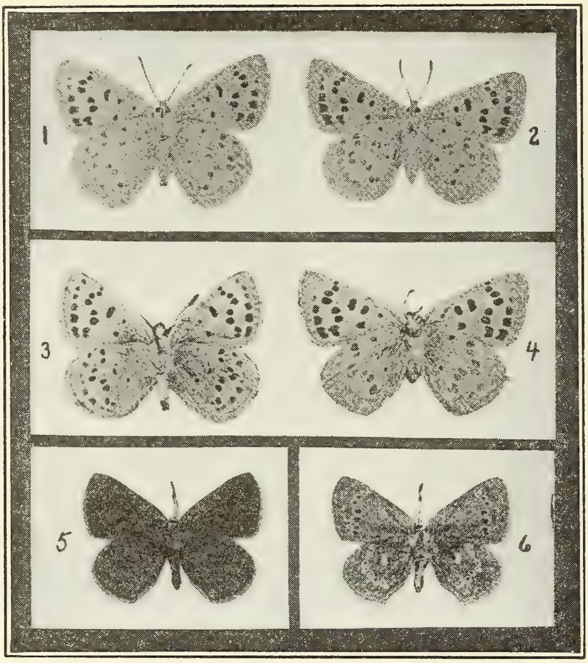
Canadian.

Papilio zelicaon (T., H.)
Papilio rutulus T.
Papilio eurymedon (T.)
Parnassius clodius (T.)
Parnassius smintheus T., (H.)
Ascia sisymbrii T.
Ascia occidentalis U. S., T., H.
Ascia napi T., H.
Euchloë ausonides (T).
Anthocharis sara julia T.
Eurymus alexandra (T.)
Eurymus scudderii (T.)
Coenonympha ochracea (U. S.) T.
Coenonympha haydenii (H.)
Erebia epipsodea
Dryas hesperis T.
Dryas hydaspe
Dryas eurynome (T.)
Euphydryas editha
Euphydryas anicia (T.)
Polygonia satyrus T.
Polygonia hylas T.
Polygonia zephyrus T.
Lycaena mariposa
Plebeius aquilo rustica T., H.
Plebeius icarioides U. S., T.
Plebeius saepiolus U. S., T., H.

Glaucopsyche lygdamus U. S., T., H.
Lycaenopsis pseudargiolus T.
Polites draco (T.)

Hudsonian.

Eurymus meadii (C.)
Brenthis freija C.



Approximately × 3/4.

Fig. 1. Under side, holotype male, *Lycaena heteronea gravenotata* Kots.

Fig. 2. Under side, allotype, female, *L. heteronea gravenotata* Klots.

Fig. 3. Under side, paratype male 10, *L. heteronea gravenotata* Klots.

Fig. 4. Under side, paratype female 17, *L. heteronea gravenotata* Klots.

Fig. 5. Upper side, holotype male, *Satyrium fuliginosa semiluna* Klots.

Fig. 6. Under side, holotype male, *Satyrium fuliginosa semiluna* Klots.

For data on specimens figured see text.

SIX NEW SPECIES OF TENAGOBIA BERGROTH (HEMIPTERA, CORIXIDAE).

By Howard O. Deay, Lafayette, Indiana.

In working over the *Tenagobia* material in the University of Kansas Entomological collection, the writer found six species, whose descriptions follow, which are new to science.

Tenagobia minuta sp. nov. (Pl. I, figs. 1, 4, 10, 14.)

Size: Length, male 1.8 mm.; female 1.8–2.0 mm. Width of head, male 0.75.; female 0.78 mm.

Color: Above brownish yellow, marked with indistinct fuscous irrorations; eyes darker, sometimes crossed with light bands; front transparent yellowish grey with dark irrorations; scutellum sometimes with indistinct, broken, longitudinal reddish stripes; costal margins of hemelytra each bearing three fuscous maculations. Underside of thorax and legs uniformly yellowish grey; abdomen darker, sometimes fuscous.

Structural characteristics: Head: Posterior margin of vertex with median tubercle, caudo-lateral angles but little produced laterally; an eye about 3/4 as wide as interocular space; posterior margin of eyes approximate the posterior margin of head. *Prothorax:* No moustache-like bristles on lateral margins, cephalic aspect; pronotum 5 times wider than its median length, 2½ times wider than posterior margin of vertex, 2 times wider than base of scutellum, anterior margin angulate, posterior margin truncate in front of bases of hemelytra and concavely arcuate in front of scutellum. *Scutellum:* Relatively large, approximately twice as long as median length of pronotum, 1¼ times wider than long, apex very acutely angled. *Hemelytra:* Exceed abdomen about 0.2 mm. in male, slightly in female; membranal suture distinct in left hemelytron but not in right; minute peg-like setae scattered irregularly over hemelytra, more on posterior half of right, distinct longitudinal impression along each costal margin. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum, and from apex of scutellum to apex of clavus is as 22: 21: 40: 70. *Wings:* present. *Abdomen:* 5th segment with one spine-like seta on either side; 6th segment with 2 spine-like setae on either side; 7th segment with 4 spine-like setae on either side, a circular patch of minute setae in dextrocephalic angle of tergum; 8th segment with 3 lateral and 1 terminal spine-like setae on either side, the tergite-tongue with 12 hair-like setae, the right half of segment with a hump-like projection on mesal margin near caudal end which bears a tuft of short bristle-like setae. *Claspers:* The left with a membranous, club-shaped, weak distal end beset with papillae, the basal and connective parts much stronger; the right the same texture throughout, apex pointed, the dorsal margin flattened in front of the apex and then curves down to join the base, 5 short spinelike setae on right side. *Legs:* Front, with 2 spine-like setae on inner underneath side of femur, tarsus proportionately large, as long as tibia, 13 bristle-like setae on lower edge, setae of inner row, except terminal ones, very minute, 5 long hair-like setae in upper row; tarsal-claw large, disc-shaped, constricted into neck at base. Middle, ratio of lengths of femur, tibia, tarsus and tarsal claws is as 32: 12: 15: 11.

Described from a series of 4 males and 3 females bearing the label: Boquerón river, Panamá, May, 1907. August Busck.

The Boquerón river is an inland stream east of the Canal Zone. It flows into the Pequeni river which in turn empties into Rio Chagres.

Holotype male. All types in the University of Kansas Entomological collection.

Comparative notes: T. minuta is the smallest of the known species of *Tenagobia.* It belongs to the group which has the pronotum truncate in front of the bases of the hemelytra. Four species compose this group at present; *marmorata* Bergroth, *pulchra* Hungerford, *minuta* sp. nov. and *truncata* sp. nov. *T. minuta* can be distinguished from *marmorata* by the fact that the scutellum is twice as long as the pronotum instead of "little longer." It can be distinguished from *pulchra* by the shape of the claspers and the tergite-tongue of the 8th abdominal segment, and by the fore-tarsus in *pulchra* being shorter than the tibia. The distinguishing characteristic of *T. truncata* sp. nov. will be given under the discussion of that species.

Tenagobia truncata sp. nov. (Pl. I, figs. 5, 7, 8, 11.)

Size: Length, male 2.17 mm.; female 2.3 mm. Width across head, male 0.8 mm.; female 0.9 mm.

Color: Uniformly brownish to fuscous above; front lighter; no maculations on lateral margins of hemelytra; bases of clavi lighter; scutellum sometimes with lighter longitudinal lines. Venter fuscous; legs uniformly greyish yellow.

Structural characteristics: Head: Posterior margin of vertex with minute median tubercle, caudo-lateral angles but little produced laterally; an eye about 4/5 as wide as interocular space; posterior margin of eyes narrowly separated from the posterior margin of head. *Prothorax:* No moustache-like bristles on lateral margins, cephalic aspect; pronotum 5 times wider than median length, maximum width a little more than base of head, nearly 3 times wider than posterior margin of vertex, 2½ times wider than base of scutellum, anterior margin angulate, posterior margin truncate in front of bases of hemelytra and concavely arcuate in front of scutellum. *Scutellum:* Approximately twice as long as median length of pronotum, about 1 1/6 times wider than long, apex very acutely angled. *Hemelytra:* Exceeds abdomen about 0.2 mm. in male, slightly in female; membranal suture distinct in left hemelytron but not in right; minute peg-like setae scattered irregularly over the hemelytra, rather numerous along the lateral margins. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum, and from apex of scutellum to apex of clavus is as 28 : 28 : 55 : 80. *Wings:* Present. *Abdomen:* 5th segment with 3 short spine-like setae on either side; 6th segment with 4 short spine-like setae on either side; 7th segment with 4 short spine-like setae on either side, circular patch of minute setae in dextro-cephalic angle of tergum as in *minuta*; 8th segment with 3 lateral and 1 terminal short spine-like setae. *Claspers:* the left membranous and spoon-shaped distally (the drawing is of the lateral aspect), the basal and connective parts much stronger; the right resembles that of *minuta*, the 6 minute spine-like setae are more distad than in *minuta*, it differs in shape in that it tapers gradually from the apex to the base dorsally. *Legs:* Front rather slender, femur with two spines on inner underneath side, tarsus noticeably shorter than tibia, 14 bristle-like setae on lower edge, 11 hairs in inner row, 4 long hair-like setae in upper row; tarsal claw large. Ratio of lengths of femur, tibia, tarsus and tarsal claws of middle leg is as 32 : 10 : 15 : 9.

Described from a series of 2 males and 4 females bearing the label: F. X. Williams, Tena, near Oriente, Ecuador, March 29–April 10, 1923.

Holotype male. All types in the University of Kansas Entomological collection.

Comparative notes: This species as the preceding belongs to the group with the pronotum truncate in front of the bases of the hemelytra. It is distinguished from *marmorata* Bergroth in that the scutellum is twice as long as the pronotum instead of "little longer." It differs from *minuta* in the shape of claspers, in that the 5th abdominal segment bears 3 short spine-like setae on either side while in *minuta* it bears only one, 6th abdominal segment in *truncata* bears 4 short spine-like setae, in *minuta* two, fore-tarsus in *truncata* shorter than tibia, in *minuta* the fore-tarsus is as long as tibia, the eighth abdominal segment in *truncata* is proportionally much smaller than in *minuta.* *T. truncata* can be distinguished from *pulchra* by the shape of the claspers and the tergite-tongue, and in the fact that *pulchra* has no circular patch of minute setae in the dextro-cephalic angle of the 7th abdominal tergum.

Tenagobia mexicana sp. nov. (Pl. I, figs, 2, 3, 12, 13.)

Size: Length, male 2.55–2.7 mm.; female 2.85–3.0 mm. Width of head, male 0.97–1. mm.; female 1.12–1.17 mm.

Color: Brownish fuscous above; front and vertex usually yellowish transparent; lateral margins of hemelytra each with 4 dark maculations, transparent V-shaped figure near base of each clavus, slender longitudinal transparent line in right hemelytron caudad to claval suture. Venter yellowish, base of abdomen a little darker; legs and antennae yellowish.

Structural characteristics: Head: Posterior margin of vertex with a minute median tubercle, caudo-lateral angles produced laterally; an eye 4/5 as wide as interocular space; distinct, though narrow, space between the posterior margin of the eyes and posterior margin of head. *Prothorax:* No moustache-like bristles on lateral margins, cephalic aspect; pronotum 6 times wider than median length, 2½ times wider than posterior margin of vertex, about 1 6/10 times wider than base of scutellum, posterior margin not truncate in front of bases of hemelytra, narrowed at ends. *Scutellum:* 3 times longer than median length of pronotum, 1 1/3 times wider than long. *Hemelytra:* Exceeds abdomen about 0.3 mm. in male, slightly in female; membranal suture distinct in left hemelytron, but not in right; minute peg-like setae scattered over the outer half of corium, those on lateral margins arranged in a row. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum, and from apex of scutellum to apex of clavus is as 2:2:6:11. *Wings:* Present. *Abdomen:* 5th, 6th, and 7th segments each with 2 short spine-like setae on either side; 8th segment with 1 terminal and 3 lateral spine-like setae on either side, the tergite-tongue with a few very weak hair-like setae, the right half of segment with a hump-like projection on mesal margin near caudal end which bears a tuft of short bristles. *Claspers:* The right not serrate ventrally, heel acute, but little produced, slight excavation anterior to it on ventral margin, caudal margin deeply excavated, toe much produced and rounded at apex; the left very striking, caudal part somewhat hammer shaped, the heel much produced, the toe acutely angled and much produced. *Legs:* Front, femur with a stiff spur which arises from a papilla-like projection on lower side, above this on inner side is a row of 4 spine-like setae; tarsus shorter than tibia, 14–15 bristle-like setae in lower row, 15–17 hairs in inner row, 8 long hair-like setae in upper row. Ratio of lengths of femur, tibia, tarsus, and tarsal claws of middle leg is as 13:4:5:4.2.

Described from a long series of males and females (about 250) which bear the label: House of General Obregón, Naimari, Sonora, Mexico, Aug. 8, 1927. Taken at light. A. Dampf.

Holotype male. All types in the University of Kansas Entomological collection.

Comparative notes: This species, as well as the following one, *serrata* sp. nov., belongs to the *signata* (White) group. This group of Tenagobia is characterized by having a large spur on the ventral side of the fore-femur. Up to the present three species, *signata* and *socialis* (White), and *incerta* Lundblad, have composed this group. To these the writer adds *mexicana* and *serrata* sp. nov. These five species are very close to each other and can be separately definitely only by examining the genital claspers of the males. Fortunately the shape of the claspers is constant within the species as well as being characteristic of the species. Among the other characters which enable one to differentiate among these species is the number of hair-like setae in the upper row of the fore-tarsus and the bristle-like setae in the lower row. *T. mexicana* is readily separated from the other species in this group by the shapes of the right and left claspers.

Tenagobia serrata sp. nov. (Pl. I, figs. 6, 9.)

Size: Length, male 2.55 mm.; female 3.–3.1 mm. Width of head, male 1. mm.; female 1.2 mm.

Color: Varies from uniform light brown to variegated dark brown; transparent V-shaped figure near base of each clavus; lateral margins of hemelytra each with 4 dark maculations; slender, transparent, longitudinal line in right hemelytron caudad to claval suture. Venter and legs uniformly yellow.

Structural characteristics: Head: The same as in *mexicana* except that caudo-lateral angles of vertex are more acute.

Prothorax: The same as *mexicana*. *Scutellum:* 2½ times wider than long. *Hemelytra:* The same as *mexicana*. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum, and from apex of scutellum to apex of clavus is as 6 : 6 : 15 : 30. *Wings:* Present. *Abdomen:* The shape of tergites and location of the spine-like setae the same as in *mexicana*. *Claspers:* The right with a double row of serratures ventrally, the heel very acute, a deep excavation immediately proximad to it, the toe somewhat produced and rounded. The left rather simple, heel not developed, toe pointed, resembles that of *signata* (White) rather closely. *Legs:* Fore-leg is identical with that of *mexicana* in shape and in the peg and row of spine-like setae on femur, the number of setae on the tarsus differs, however, there being 10 long hair-like setae in the upper row in this species and but 8 in *mexicana*.

Described from a series of 1 male and 8 females bearing the label: Lower Mamore River, December, 1913. Steinbach.

The Lower Mamore River is in central Bolivia north of Santa Cruz.

Holotype male. All types in the University of Kansas Entological collection.

Comparative notes: This species, as was stated under the discussion of *mexicana*, belongs to the *signata* group. It is readily distinguished from the other members of this group by the double row of serratures on the ventral side and the shape of the right clasper.

Tenagobia constricta sp. nov. (Pl. II, figs. 1, 4, 6, 7, 10, 11.)

Size: Length, male 2.80 mm.; female 3.0 mm. Width of head, male 1.05 mm.; female 1.20 mm.

Color: Uniformly fuscous brown above; front and vertex transparent yellowish grey, posterior margin of vertex darker; lateral margins of hemelytra lighter, each with two fuscous maculations. Ventral aspect of thorax yellowish, abdomen darker; legs yellowish, slightly darker at distal ends.

Structural characteristics: Head: Posterior margin of vertex sinuate, caudo-lateral angles not produced laterally; an eye 1¼ times wider than interocular space; posterior margin of eyes distinctly separated from the posterior margin of the head. *Prothorax:* Moustache-like bristles on lateral margins, cephalic aspect; pronotum a little narrower than head, 6½ times wider than median length, 2 times wider than base of scutellum; posterior margin not truncate in front of bases of hemelytra, narrowed at ends. *Scutellum:* Approximately

2½ times longer than median length of pronotum, 1 1/5 times wider than long. *Hemelytra:* Same shape as those of *T. romani* Lundblad; exceed abdomen about 0.2 mm. in male, slightly in female; membranal sutures both distinct; minute peg-like setae scattered irregularly over the hemelytra; very fine hair-like setae distally; distinct longitudinal impressions on each lateral margin anteriorly, many bristle-like setae in the impressions. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum and from apex of scutellum to apex of clavus is as 50: 21: 50: 135. *Wings:* Present. *Abdomen:* 5th and 6th segments each with two short spine-like setae on each side; 7th segment relatively long, with 2 spine-like setae on each side; 8th segment with 1 lateral and 1 terminal spine-like setae on either side, tergite-tongue rather truncate at end, bearing 15 long hair-like setae. *Claspers:* The right has a membranous basal portion, the distal part shaped somewhat like a sled-runner with a notch about mid-way of dorsal surface; the left with a membranous, hairy cap set on the upturned distal end. *Legs:* Front long and slender, femur with 2 weak spine-like setae on inner underneath side, 13 bristle-like setae in lower row, about 14 hairs in inner row, 5 long hair-like setae in upper row; tarsal claw very slender. Ratio of lengths of femur, tibia, tarsus and tarsal claws of middle leg is as 62: 18: 25: 15.

Described from a series of 2 males and 14 females bearing the label: F. X. Williams, Tena, Ecuador, Feb. 28, 1923.

Holotype male. All types in the University of Kansas Entomological collection.

Comparative notes: This species is very closely related to *T. romani* Lundblad. They agree in being the only two known species of *Tenagobia* that have such narrow interocular spaces, in the shape of fore-legs, in the number of spine-like setae on fore-femur, in shape of hemelytra, and the dorsal aspect of abdomen. They can be readily distinguished by the shape of the claspers, both of which are distinct; by the fact that *constricta* is uniformly colored and *romani* is not; by the number of bristle-like setae on the lower edge of the fore-tarsus, *romani* has about 22, *constricta* only 13; and in *romani* there are 2 lateral spine-like setae on 8th abdominal segment, in *constricta* only 1.

Tenagobia hungerfordi sp. nov. (Pl. II, figs. 2, 3, 5, 8, 9.)

Size: Length, male 2.85 mm.; female 3.–3.15 mm. Width of head, male 1.05 mm.; female 1.2 mm.

Color: Brownish fuscous above; eyes dark; vertex and front greyish transparent; hemelytra with lateral margins lighter and four dark maculations on each; the usual transparent V-shaped figure at base of each clavus. Yellowish beneath, hind legs darker distally.

Structural characteristics: Head: Posterior margin of vertex without median tubercle, caudo-lateral angles obtuse; an eye slightly narrower than interocular space; posterior margin of eyes widely separated from the posterior margin of head. *Prothorax:* Moustache-like bristles present on lateral margins, cephalic aspect; pronotum about 7 times wider than median length, 4 times wider than posterior margin of vertex, 2 times wider than base of scutellum, posterior margin not truncate in front of bases of hemelytra, narrowed at ends. *Scutellum:* 2½ times as long as median length of pronotum, 1½ times wider than long, apex very acutely angled. *Hemelytra:* Membranes well developed, the left transparent; many minute peg-like setae scattered irregularly over entire hemelytra, numerous fine hair-like setae distally; deep longitudinal impression near each lateral margin in which there is a row of larger setae. Ratio of lengths (dorsal aspect) of head, pronotum, scutellum, and from apex of scutellum to apex of clavus is as 55:20:50:120. *Wings:* Present. *Abdomen:* 5th, 6th, and 7th segments each with 2 spine-like setae on either side, the 5th and 6th tergites excavated on right side and projected on left; 8th segment with 1 lateral and 1 terminal spine-like setae on either side, tergite-tongue bears 11 weak hair-line setae, mesal margin sinuate, right half of segment with a tuft of short bristle-like setae on mesal margin near the caudal end. *Claspers:* The left with a brown pointed projection near the base somewhat as in *melini* and *schadei* Lundblad but is more pointed, the distal end is upturned; in the right the distal end is bent up nearly at right angles to the basal part, ventrally there is a papilla-like projection. *Legs:* Fore-leg with a row of 6 spine-like setae on inner underneath side of femur; tarsus large, longer than tibia, 12 bristle-like setae in lower row, 13 hairs in inner row, 6 long hair-like setae in upper row. Middle leg, ratio of lengths of femur, tibia, tarsus, and tarsal claws is as 155:55:60:45.

Described from a series of 1 male and 9 females bearing the label: Corumba, Matto Grosso, Brazil, Dec. 14–22, 1919. R. G. Harris.

Holotype male. All types in the University of Kansas Entomological collection.

Comparative notes: This species is close to *melini* and *schadei* Lundblad. It differs from *melini* in the shape of claspers, in that it has but 12 bristle-like setae in lower row on fore-tarsus while *melini* has 18, and in that it has 2 spine-like setae on each lateral margin of 6th abdominal segment instead of 1 as *melini* has. It is at once distinguished from *schadei* by the fact that *schadei* has no minute peg-like setae on the hemelytra. The two species are further distinguished by the shape of the claspers, and in that *schadei* has but 5 hair-like setae in the upper row on the fore-tarsus while *hungerfordi* has 6.

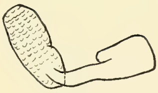
This species is named for Dr. H. B. Hungerford, of the University of Kansas.

PLATE IX.

1. Left clasper, *Tenagobia minuta* sp. nov.
2. Left clasper, *T. mexicana* sp. nov.
3. Right clasper, *T. mexicana.*
4. Right clasper, *T. minuta.*
5. Left clasper, *T. truncata* sp. nov.
6. Left clasper, *T. serrata* sp. nov.
7. Left part of 8th abdominal segment, *T. truncata.*
8. Head and pronotum, *T. truncata.*
9. Right clasper, *T. serrata.*
10. Left part of 8th abdominal segment, *T. minuta.*
11. Inner side of right fore-leg, *T. truncata.*
12. Inner side of left fore-leg, *T. mexicana.*
13. Left part of 8th abdominal segment, *T. mexicana.*
14. Inner side of left fore-leg, *T. minuta.*

PLATE X.

1. Left clasper, *Tenagobia constricta* sp. nov.
2. Right clasper, *T. hungerfordi* sp. nov.
3. Left clasper, *T. hungerfordi.*
4. Right clasper, *T. constricta.*
5. Head, *T. hungerfordi.*
6. Left part of 8th abdominal segment, *T. constricta.*
7. Head, pronotum and scutellum, *T. constricta.*
8. Left part of 8th abdominal segment, *T. hungerfordi.*
9. Inner side of right fore-leg, *T. hungerfordi.*
10. Inner side of left fore-leg, *T. constricta.*
11. Tarsal claw, *T. constricta.*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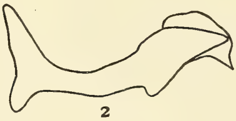
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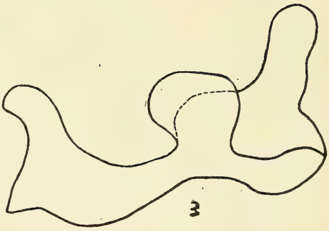
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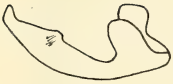
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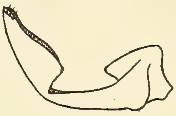
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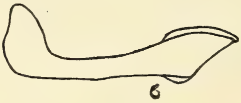
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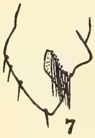
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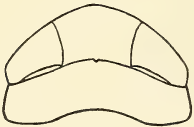
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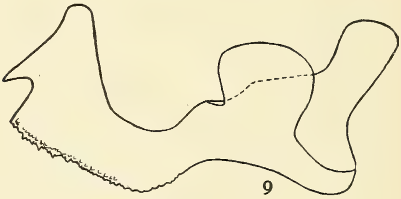
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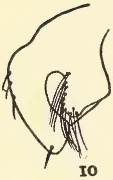
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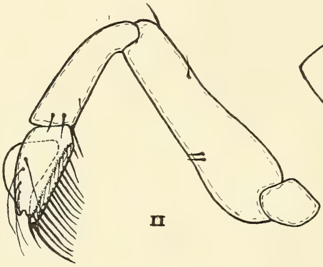
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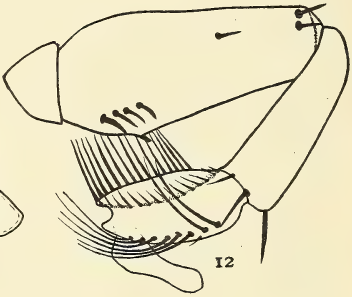
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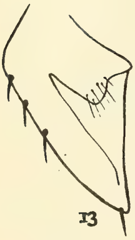
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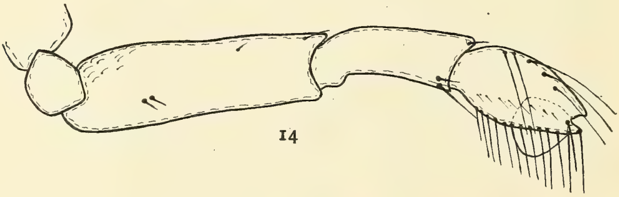
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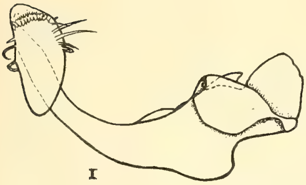

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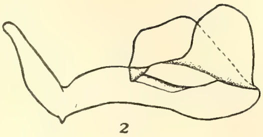

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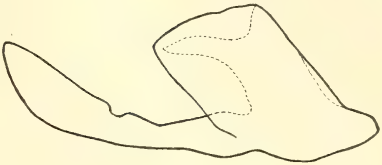

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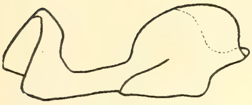

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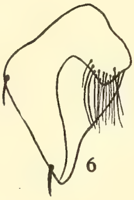

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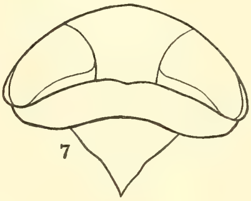

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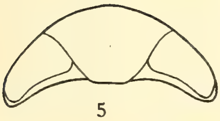

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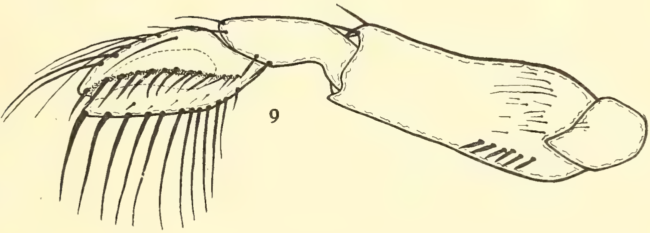

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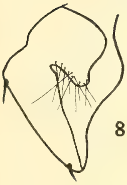

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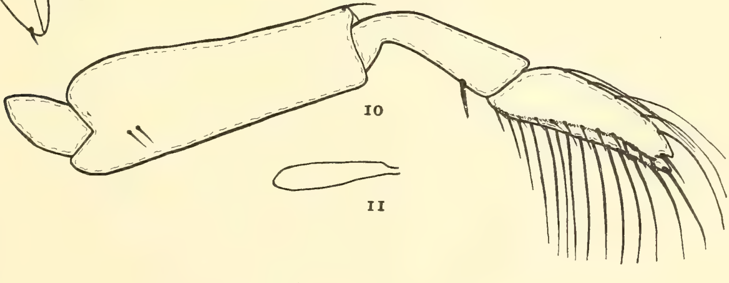

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BOOK NOTES.

A Handbook of the Mosquitoes of North America. Their Structure. How they Live. How they Carry Disease. How they may be Studied. How they may be Controlled. How they may be Identified. By ROBERT MATHESON. Charles C. Thomas, Springfield, Ill., and Baltimore, Md., 1929, xvii + 268 pp., frontispiece, 25 plates and 23 text figures. (Price, $5.50.)

This new manual of the mosquitoes seems to differ from some of the similar previous attempts, mainly in being written from the entomologist's point of view and consequently with a better understanding of the beginners' real needs. The hope, however, expressed in the Preface, that even "the average citizen" may be able to identify with it our common species, must have surged from the heart of an optimist.

The general chapters dealing with the characteristics of mosquitoes, their biology, their relation to human welfare, their control, and the methods of their study, are excellent. They present the fundamentals in a concise, yet clear, style, and are unusually free from disputed and unnecessary technicalities, as well as from dubious statements. The text illustrations that go with these chapters are much better than the average and are worthy models for the novice to follow. The same is true of the drawings shown in the plates; although it seems a pity that in a manual the line drawings of the male genitalia should be crowded together in the back of the book, instead of scattered for handy reference in the text under the respective species. It is also rather unfortunate that the elegant colored frontispiece bears no caption whatsoever and is not even mentioned in the explanation of the plates. Indeed, the reader will have to reach p. 83 before learning that it represents an anopheline, and p. 87 before being told that it is *Anopheles quadrimaculatus.* In the captions of Plates III to VII, which show breeding places of certain common mosquitoes, we miss a reference to the localities illustrated; presumably the photographs were taken in central New York.

The taxonomic part purports to cover the Culicinae of North America; at least we are told so in the Preface, p. vi. This is, however, not strictly true. For, quite apart from any reduction in the number of species due to synonymy, some twenty southern and western species have not been included. A few of these have nevertheless been mentioned in the keys and it would seem that very little additional labor could have managed a place there for the remainder too. This would certainly have increased the value of the book to the student in the Southern States and in California. The handbook seems to cover very fully the fauna of northeastern America, as far south as Georgia and as far west as the Rockies. I have noticed the absence of only one species which is occasionally taken in Arkansas and Missouri. The key to the genera covers all the forms known north of Mexico, including even *Deinocerites,* which is not mentioned elsewhere in the book.

The descriptions of the adults and larvæ of the several species appear quite adequate and are evidently based upon an original study of actual specimens. In relatively few exceptions they have been quoted from Dyar's publications, as is clearly indicated in each case. The diligent new descriptions of the older species are most commendable. Obviously in Entomology we need more of this type of critical and synthetic work and less of the perpetual pursuit of supposed "new species." Perhaps a fuller characterization of the genera would have been welcome, since the only characters given of these groups are contained in a very short key. The beginner might thus get the erroneous idea that no other valid differences separate the genera.

In a taxonomic handbook special care should, of course, be given to the drawing up of workable keys; for, if they are unduly intricate or unreliable, they will only too often discourage the novice. I have tested Professor Matheson's keys with a number of common species and was pleased to find them more serviceable than some other published dichotomies. My only criticism would be that in the key to the genera rather undue and, I believe, unnecessary prominence is given to peculiarities of the thoracic chaetotaxy. I do not wish to dispute the value of these characters, even though in some cases the very same condition is given generic value, which in others serves only to separate the species within one genus. I also realize the author's obvious desire to bring these characters to the foreground. Yet the addition of more readily accessible characters could have given the student an added sense of security in his identifications.

The book lacks the customary and seemingly unavoidable Errata, which does not mean that it is free from printer's errors. The most unfortunate occurs on p. 204, where *Megarhinus* is misspelled five times "*Megharinus,*" although it is correctly spelled on several other occasions, as well as in the *Index.* I was glad to see that the author has taken pains to make the specific adjectives agree in gender with their generic names, thus sparing us such philological horrors as "*Megarhinus rutila*" and "*Psorophora horridus.*"

The typographical presentation and the binding set better standards than those we have endured in some post-war manuals. I fear, however, that the cost of the book will not make the study of mosquitoes more popular than it has been heretofore.—J. BEQUAERT, Department of Tropical Medicine, Harvard Medical School.

The Gall Wasps of the Genus Cynips—A Study in the Origin of Species—by Alfred C. Kinsey. Indiana University Studies, vol. xvi, Studies nos. 84, 85, 86, pp. 1–577, figs. 1–429. (Waterman Institute Publication, no. 42, price $2.50.)

Here we have a study on one of the great principles of evolution which has the validity of research and experimentation on a fixed group by planned and controlled methods and means. The group in itself is small enough in number of species and great enough in number of individuals to make it possible to examine such large numbers that the coefficient of error is diminished to so great a degree as to become negligible. The author has examined no less than 54,000 galls and 17,000 individuals in the course of his inquiry into "the nature of species, individual variation, mutation and hybridization in nature, and the factors affecting the origin of species."

The nature of this work and its extensive character make it unwise to do more than strongly draw the attention of biologists to it. Doubtless in time careful analyses and evaluations of the results will appear, but this is no place for them.

From the point of view of the Hymenopterist, this is an excellent piece of biological work, which puts the genus on an absolute working basis. In addition to all the biological and genetical data, there is a study of the systematics of *Cynips,* with descriptions of 48 heretofore unknown or unrecognized species.

At a later date we shall hope to publish a more extensive critique by a hymenopterist of standing. Meantime, as a serious study of what species are and how they evolve, every biologist should become acquainted with this work of Dr. Kinsey's.—J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF JANUARY 16, 1930.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on January 16, 1930, at 8.20 p. m.

President Davis in the Chair and 18 members present, viz.:

Messrs. Anderson,
Ballou,
Bell,
Black,
Burke,
Chapin,
Cooper,
Eisenhardt,
Engelhart,
Lemmer,
Risch,
Schaeffer,
Sever,
Sheridan,
Siepmann,
Torre-Bueno,
Wilford and
Lersch; and several visitors.

Minutes of the previous meeting read and approved.

Mr. Engelhardt presented a detailed annual report of the Treasurer, showing the Society to be in a very sound financial condition, which is particularly gratifying in view of there having been no donations from private sources or other outside help, the only revenue other than that from dues, subscriptions and sales of the Society's publications being the receipt of $100 from the sale of the excess material in the Weeks Collection.

Mr. Torre-Bueno stated that he would not make the formal annual report of the Publication Committee at this time but would present it at the February meeting.

Mr. Sheridan, as Chairman of the Nominating Committee, presented for re-election the present officers of the Society, to serve for the year 1930; and it was regularly moved, and seconded and carried, that they be elected.

Mr. Englehardt proposed for membership:

Mr. Everett Lersch,
227 Union Avenue,
Mt. Vernon, N. Y.

As Mr. Lersch was present, it was regularly moved and seconded that the by-laws be suspended and Mr. Lersch be elected to membership; this was unanimously carried.

Mr. Engelhardt reported that he had been looking over the file of BULLETINS vols. 5 and 6 with the object in view of having the missing numbers in these volumes reprinted in order to have about 50 complete volumes on hand to fill orders for them and that he would get quotations as to the cost of having this done.

Mr. Cooper read a paper entitled "A List of Coleoptera Found at Flushing, New to Long Island," which will be published in full.

Mr. Eisenhardt presented his paper "Colias of the World"; he stated that there are 51 species and 193 variations from the typical form, known from the various regions of the World, except the Torrid Zone; of these 33 species are found in the Palaearctic Region; 6 in the Indo-Australian Region, which are also included in the 33 from the Palaearctic Region; 17 in North America, of which 4 are included in those from the Palaearctic Region; 4 from South America; and 1 from Africa. He exhibited two boxes of specimens representing 32 species and a number of forms and remarked at length on their habitat, color and variations. He stated that most of the species are clover feeders and that there are from one to three generations each year. A list of the species and variations exhibited, giving their habitat, is attached. Mr. Eisenhardt's paper was discussed at length by the members.

Mr. Davis remarked on some cocoons of *Callosamia promethea* Drury and *Philosamia walkeri* Felder, more familiarly known as *cynthia* Drury from which the moths had failed to emerge at the usual time and had carried over until the next year; he exhibited the specimens and remarked on their apparently normal appearance in size and maculation and gave in detail the date of their emergence. He will publish his paper in full.

Mr. Davis also read from a letter from Mr. Austin H. Clark giving a list of the female forms of *Papilio glaucus* Linnaeus; there being six forms in the list instead of two usually recognized.

Adjourned at 10.15 p. m.

E. L. Bell,
Secretary.

Vol. XXV OCTOBER, 1930 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
OCT 30 1930
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
E. L. BELL GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

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Vol. XXV October, 1930 No. 4

NEW SPECIES OF CERATOCAPSUS (HEMIPTERA, MIRIDAE).[1]

By Harry H. Knight, Ames, Iowa.

Ceratocapsus camelus n. sp.

Distinguished by the slender form of the male, dark brownish black in color with a silvery, sericeous, pubescent band across middle of hemelytra; female brachypterous, hemelytra only extending to middle of abdomen, each corium strongly, tumidly convex on middle.

♂. Length 3.8 mm., width 1.08 mm. Head: width .73 mm., vertex .38 mm.; vertex convexly rounded, basal edge thin, slightly overlapping the collar; surface of the eyes conforming to the same surface plane as the frons and vertex; basal margin of vertex with four and frons with several erect, pale, bristle-like hairs. Rostrum, length 1.34 mm., reaching to base of hind coxae. Antennae: segment I, length .23 mm.; II, .75 mm., cylindrical, more slender at base, apical half slightly exceeding thickness of segment I; III, .47 mm., equal to thickness of segment I but more slender at base; IV, .47 mm., equal to thickness of segment III; clothed with short, fine, pale pubescence. Pronotum: length .82 mm., width at base 1.08 mm.; nearly campanulate in form, lateral margins sulcate, coxal clefts visible from above; disk strongly convex, smooth, shining, calli scarcely evident, collar flat and overlapped by the vertex.

Color dark brown to blackish, more black on pronotal disk and cuneus, shining; ostiolar peritreme white, somewhat protruding laterally. Hemelytra dark brown, translucent, strongly shining, embolar margins sinuate; with a silvery sericeous pubescent band across middle of corium and crossing the clavus near apex, also with similar sericeous pubescence at base of clavus and across middle of scutellum; beset with several erect, moderately long, yellowish, bristle-like hairs on scutellum, clavus and inner angles of corium, also intermixed with fine, short, simple pubescent hairs; cuneus scarcely deflexed, uniformly brownish black, slightly paler at fracture. Membrane uniformly dark fuscous, bordering the cuneus, between and within the larger areoles except narrowly bordering the paracuneus, pale. Legs dark brown, tips of femora and the tarsi somewhat paler; coxae pale, darker on base, front pair reddish brown on apical half; hind femora decurved on apical half. Genital structures distinctive, right clasper bifurcate, each half curving in a semicircle, the tips nearly in contact; left clasper forked at base, dorsal prong projecting distad, apex acuminate, curved like a claw, also with a small spine beneath at base of claw, ventral half flattened, broad, then narrowing to acuminate apex; also third prong arising from left clasper at inner side of base, slender, sinuate, projecting distad, apical half curving to the right side.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

♀. Length 2.8 mm.; brachypterous, width across abdomen 1.12 mm. Head: width .80 mm., vertex .52 mm.; head large, eyes rather small, frons, vertex and tylus forming an arcuate line as viewed from the side. Rostrum, length 1.3 mm. extending slightly beyond middle of hind coxae. Antennae: segment I, length .22 mm., pale brownish; II, 1.77 mm., slightly tapering from base to larger at apex, brownish black; III, broken. The other antenna apparently deformed, segment II only 1.6 mm. in length. Pronotum: length .65 mm., width at base .67 mm.; disk strongly convex, base strongly depressed to a point below level of anterior margin, sides rounded and slightly sinuate, coxal clefts visible from above. Scutellum depressed, small, triangular, the mesoscutum visible, sharply declivent. Hemelytra brachypterous, reaching to middle of abdomen, depressed on base, corium tumidly convex on apical area, shining, apical and inner margins thickly clothed with silvery, sericeous pubescence, also beset with several erect, fine long hairs, also with similar hairs on the abdomen; cuneus and membrane absent. Base of venter with a frosted spot each side behind the coxa.

Holotype: ♂ August 21, 1926, Urbana, Illinois (Vera Smith); author's collection. *Allotype:* same data as the type.

Ceratocapsus fascipennis n. sp.

Allied to *camelus* and having much the same color aspect but differs distinctly in structure of the genital structures; scutellum more convex, ostiolar peritreme with a reddish brown, laterally projecting tubercle.

♂. Length 4.3 mm., width 1.2 mm. Head: width .80 mm., vertex .37 mm.; form very similar to that of *camelus.* Rostrum, length 1.43 mm., extending to middle of metasternum. Antennae: segment I, length .28 mm., pale brownish, a reddish mark on ventral aspect; II, .86 mm., cylindrical, more slender at base, apical half slightly exceeding thickness of segment I; III, .47 mm., slightly exceeding thickness of first segment; IV, .47 mm., equal in thickness to segment III; dark brown to blackish; clothed with short, fine, pale pubescence. Pronotum: length .95 mm., width at base 1.21 mm.; form nearly as in *camelus,* but disk somewhat more strongly convex. Scutellum small, triangular, only very slightly convex, with silvery, sericeous pubescence across middle; mesoscutum prominent, strongly declivent to base of scutellum.

Color dark brown to blackish, shining, paler brown on clavus and basal half of corium; ostiolar peritreme white, with a reddish brown, laterally projecting tubercle; a silvery, sericeous pubescent band across clavus at about half way between apex and tip of scutellum, angling obliquely forward across corium; also with a similar but narrower sericeous band running obliquely across base of clavus and joining with similar pubescence on middle of scutellum. Scutellum with about eight, erect, pale bristles, and clavus with about as many but less prominent bristles; the whole dorsum also clothed with rather fine, short, simple pubescence. Membrane uniformly dark fuscous, areoles and narrowly bordering apex of cuneus, pale. Cuneus scarcely deflexed, embolar margins sinuate. Legs dark brown, coxae and trochanters pale, tarsi yellowish; hind femora decurved apically, tips pale; hind tibiae distinctly bowed.

Genital structures distinctive, base of left clasper with a slender, dorsally projecting prong, and decurved apically; right clasper with a simple, distally projecting process, slightly curved and thicker on basal half, with a small spine on inner side near base.

Holotype: ♂ June 20, 1928, alt. 6200 ft., Chiricahua Mts., Arizona (A. A. Nichol); author's collection. *Paratype:* ♂ July 8, 1905, Huachuca Mts., Arizona (H. G. Barber).

Ceratocapsus barberi n. sp.

Suggestive of *fascipennis* in having two transverse, silvery pubescent bands across hemelytra, but differs in the scarcely arched mesoscutum, flatter frons and vertex, straight femora, and very different genital structures.

♂. Length 4 mm., width 1.25 mm. Head: width .84 mm., vertex .30 mm.; vertex and frons flat, dorsal extremity of eyes extending very little above level of vertex. Rostrum extending to near hind margins of posterior coxae (imbedded in glue.) Antennae: segment I, length .25 mm.; II, .99 mm., slightly more slender on basal half; III, .56 mm., equal in thickness to apex of segment II; IV, .56 mm. equal in thickness to segment III; uniformly dark reddish brown, segment I paler and marked with dark red. Pronotum: length .69 mm., width at base 1.12 mm.; disk moderately and evenly convex, lateral margins slightly sulcate. Scutellum only very slightly convex, mesoscutum normal, nearly covered by pronotal disk.

Color rather uniformly dark reddish brown, disk of pronotum somewhat darker, entire surface strongly shining. Hemelytra with costal margins very slightly sulcate, with silvery, sericeous pubescent band cross base of clavus and middle of scutellum, also a second band crossing the corium and apical third of clavus. Cuneus scarcely deflexed, reddish brown like the clavus. Membrane uniformly pale fuscous, pale at base between larger areoles and bordering tip of cuneus. Clothed with fine, simple, pale yellowish pubescence, scutellum and clavus with several erect, bristle-like hairs. Ostiolar peritreme white, reddish on the protruding tubercle. Legs uniformly reddish brown, tarsi pale brownish. Genital claspers distinctive, right clasper short, slightly thickened, dorsal margin extending as a long slender hook, attaining dorsal median line of genital segment where it is sharply decurved and slenderly acuminate at tip.

Holotype: ♂ July 12, 1905, Huachuca Mts., Arizona (H. G. Barber), collected at light; author's collection. Named for my friend, Mr. H. G. Barber, who collected and presented the unique specimen.

Ceratocapsus oculatus n. sp.

Runs in my key (Hemiptera Connecticut, 1923, p. 525) to *fuscinus* Kngt., but differs from this and allied species by the small size and short antennal segments; the male differs in the large eyes, narrow vertex and nearly obsolete genae, also by the simple form of the genital claspers.

♂. Length 2.6 mm., width 1.14 mm. Head: width .78 mm., vertex .17 mm.; eyes large, raised somewhat above level of vertex, extending below to near the rostrum, the genae reduced to a mere trace. Rostrum, length .91 mm., reaching to near hind margins of middle coxae. Antennae: segment I, length .20 mm.; II, .65 mm., nearly cylindrical, tapering slightly on basal half; III, .39 mm.; IV, .35 mm.; segments of nearly equal thickness, yellowish brown, last two segments dark brown. Pronotum: length .54 mm., width at base 1.01 mm.

Color rather uniformly yellowish brown, cuneus reddish brown. Membrane and veins fuscous, paler within the areoles. Dorsum distinctly punctate, punctures infuscated. Clothed with simple yellowish pubescence and intermixed with silvery, sericeous pubescence, the latter less abundant. Genital claspers distinctive; right clasper in the form of a small rounded knob; left clasper thickened at the base but without dorsal process, terminal portion curving about the aedeagus, blade-like, acuminate at tip.

♀. Length 2.8 mm., width 1.25 mm. Head: width .69 mm., vertex .30 mm.; eyes much smaller and vertex broader than in the male. Antennae: segment I, length .17 mm.; II, .60 mm.; III, .39 mm.; IV, .38 mm. Pronotum: length .54 mm., width at base 1.05 mm. Pubescence and puncturation very similar to that of the male.

Holotype: ♂ August 1, 1906, Brownsville, Texas, (A. B. Wolcott), "on Ebony at Old Fort Brown;" author's collection. *Allotype:* same data as the type. *Paratypes:* ♀, taken with types. 2 ♂ Nov. 19, ♂ 2 ♀ Dec. 7, 1910, Brownsville, Texas.

Ceratocapsus fanseriae n. sp.

Allied to *biformis* Kngt. but size smaller and color more brownish; differs in the more rounded curve of the ventral hook of right genital clasper.

♂. Length 4.1 mm., width 1.3 mm. Head: width .65 mm., vertex .24 mm.; eyes moderate in size, vertex slightly wider than dorsal width of an eye, with three or four fine punctures on middle. Rostrum, length 1.22 mm., reaching to near middle of hind coxae, pale to brownish. Antennae: segment I, length .35 mm.; II, 1.25 mm.; III, .69 mm.; IV,

.39 mm.; all segments of nearly equal thickness, length of segment II greater than combined length of segments III and IV. Pronotum: length .60 mm., width at base 1.04 mm.

Dorsum rather closely and evenly punctate, each puncture infuscated; clothed with both simple and sericeous pubescence and intermixed with more sparsely placed, long, erect hairs. Color pale yellowish to brownish, scutellum, calli and cuneus dark brown to fuscous, the latter frequently with reddish brown tinge. Membrane fuscous, areoles and bordering cuneus pale. Legs fuscous brown, coxae and basal half of femora pale. Sternum dark brown, shining; ostiolar peritreme white, projecting as a blunt tubercle above opening of the canal. Genital claspers distinctive, rather similar to those of *biformis,* but ventral hook or right clasper more rounded, not angulate, the dorsal hook nearly touching the tip of the ventral hook.

♀. Length 3.6 mm., width 1.3 mm. Head: width .67 mm., vertex .30 mm. Antennae: segment I, length .34 mm.; II, 1.21 mm.; III, .69 mm.; IV, .43 mm. Pronotum: length .62 mm., width at base 1.08 mm. Slightly more robust than the male but very similar in puncturation, pubescence and coloration.

Holotype: ♂ February 12, 1928, alt. 3000 ft., Santa Catalina Mts., Arizona (A. A. Nichol). *Allotype:* same data as type. *Paratypes:* 22 ♂ ♀, taken with the types on *Fanseria xanthofolia* where the species was breeding as reported by Mr. Nichol. ♂ July 12, 1917, Mesilla Park, New Mexico (H. H. Knight). 2 ♂ July 20, 1917, Texas Pass, Arizona (H. H. Knight). ♂ June 7, 1924, Tucson; ♂ Oct. 21, 1928, Santa Cruz Co.; ♂ Sept. 25, 1924, Santa Catalina Mts., Arizona (A. A. Nichol).

Ceratocapsus geminatus n. sp.

Allied to *tricolor* Kngt., but size smaller; differs distinctly in structure of the ostiolar peritreme and genital claspers.

♂. Length 3.9 mm., width 1.25 mm. Head: width .69 mm., vertex .32 mm.; vertex convex, slightly higher than dorsal margin of eyes. Rostrum (imbedded) apparently reaching upon hind coxae. Antennae: segment I, length .28 mm., yellowish, fuscous on base; II, 1.2 mm., cylindrical, more slender than I, brownish black, paler at base; III, .73 mm., black; IV, .56 mm., black. Pronotum: length .52 mm., width at base .97 mm.

Head and body uniformly dark brownish black, shining; hemelytra fuscous black, outer half of clavus, inner half of corium, and embolium except apically, pale; cuneus blackish, but with reddish tinge. Membrane uniformly pale fuscous, within areoles and bordering cuneus, pale. Legs dark reddish, tibiae pale reddish, tarsi pale, apices fuscous. Ostiolar peritreme distinctive, broad and flat as compared with *tricolor*. Clothed with fine, short pale yellowish pubescence, but punctures not evident on hemelytra as in *tricolor*. Genital structures distinctive; right clasper semicircular as in *tricolor*, but ventral hook shorter and broader, the dorsal hook with notch at tip forming two short spines which point mesad.

Holotype: ♂ July 21, 1898, Little Beaver, near Fort Collins, Colorado (E. D. Ball); author's collection. *Paratypes:* ♂ July 14, ♂ July 21, type locality (E. D. Ball).

Ceratocapsus juglandis n. sp.

Allied to *denticulatus* Kngt., but differs in the thicker antennal segments, more prominent eyes, darker scutellum but paler pronotum.

♂. Length 3.4 mm., width 1.25 mm. Head: width .78 mm., vertex .19 mm.; eyes prominent, projecting above level of vertex. Rostrum, length .99 mm., reaching upon intermediate coxae. Antennae: segment I, length .26 mm., pale to dusky, with red mark an anterior aspect near base; II, .95 mm., thickness .13 mm., nearly cylindrical, yellowish to fuscous; III, .60 mm., thickness .10 mm., fuscous; IV, .52 mm., fuscous. Pronotum: length .56 mm., width at base 1.08 mm.

Color pale yellowish, scutellum, cuneus, oblique band across apical half of corium and joining with inner angles of cuneus, dark fuscous; head and pronotum pale dusky brown. Membrane pale, apical area pale fuscous. Legs pale, hind tibiae fuscous brown. Clothed with fine, recumbent, yellowish pubescence, with slight tendency to fine sericeous hairs on clavus; also a row of four or five erect hairs on clavus. Genital claspers very similar to those of *denticulatus*, but right clasper terminating as two short spines of about equal length.

♀. Length 3.7 mm., width 1.4 mm. Head: width .71 mm., vertex .34 mm. Antennae: segment I, length .27 mm.; II, .99 mm.; III, .60 mm.; IV, .53 mm. Pronotum: length

.58 mm., width at base 1.17 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂ June 20, 1928, alt. 6200 ft., Chiricahua Mts., Arizona (A. A. Nichol). *Allotype:* same data as the type. *Paratypes:* 14 ♂ ♀, taken with the types on *Juglans major* by Mr. Nichol. 4 ♂ ♀ May 16, 1928, alt. 4000 ft., Santa Rita Mts.; 3 ♀ May 27, 1928, alt. 3300 ft., Rincon Mts., Arizona (A. A. Nichol), all taken on *Juglans major.* ♀ July 23, ♀ Aug. 3, 1905, Huachuca Mts., Arizona (H. G. Barber).

With the series of material at hand I am now able to determine that the specimen I described as the allotype of *denticulatus* is in reality a female of *juglandis.* This illutration should emphasize the importance of describing and labeling the allotype of all species.

Ceratocapsus decurvatus n. sp.

Allied to *pumilus* Uhler but with stronger pubescence; differs in the absence of any tubercle on dorsal margin of genital segment; also the basal prong of right genital clasper strongly decurved ventrally.

♂. Length 3.7 mm., width 1.64 mm. Head: width .79 mm., vertex .216 mm.; eyes slightly larger and more prominent than in *pumilus.* Rostrum, length 1.21 mm., only attaining hind margins of middle coxae. Antennae: segment I, length .30 mm.; II, 1.04 mm.; III, .52 mm.; IV, .39 mm.; pale yellowish, segment I with the usual red mark near base, segments III and IV reddish. Pronotum: length .67 mm., width at base 1.31 mm.

Yellowish to reddish brown, calli and propleura fuscous brown, cuneus except outer margin reddish, legs uniformly yellowish. Membrane pale fuscous with brownish tinge, slightly paler across areoles and bordering tip of cuneus. Clothed with prominent, nearly erect, yellowish pubescence and intermixed on dorsum with silvery sericeous pubescence; more strongly pubescent than in *pumilus* although the fuscous punctures on dorsum very similar. Genital structures distinctive; basal prong of right clasper strongly decurved ventrally; without tubercle on dorsal margin of genital segment.

♀. Length 3.8 mm., width .88 mm. Head: width .73 mm., vertex .32 mm. Antennae: segment I, length .30 mm.; II, 1.04 mm.; III, .52 mm.; IV, broken. Pronotum: length

.67 mm., width at base 1.32 mm. Very similar to the male in color, pubescence and puncturation.

Holotype: ♂ July 23, 1909, Saugerties, New York (H. G. Barber); author's collection. *Allotype:* same data as the type. *Paratype:* ♂ July 6, 1919, Dauphin, Pennsylvania (T. L. Guyton). ♂ Aug. 14, 1914, Beltsville, Maryland (W. L. McAtee).

Ceratocapsus truncatus n. sp.

Runs to *pumilus* Uhler in my key (Hemiptera Connecticut, 1923, p. 525), but differs structurally in the truncate tip on basal process of the right genital clasper.

♂. Length 3.7 mm., width 1.56 mm. Head: width .75 mm., vertex .24 mm. Rostrum, length 1.25 mm., attaining posterior margins of hind coxae. Antennae: segment I, length .30 mm., yellowish, with red mark near base on anterior aspect; II, 1.03 mm., yellowish to brownish; III, .56 mm., brown; IV, .43 mm, brown. Pronotum: length .67 mm., width at base 1.25 mm.

Color rather uniformly brownish black, legs except hind femora, yellowish to brownish; cuneus with reddish evident on disk. Membrane uniformly fuscous, paler within areoles and bordering tip of cuneus. Dorsum with fuscous punctures as in *pumilus;* clothed with simple yellowish hairs and closely intermixed with silvery to golden, sericeous pubescence. Genital structures distinctive; basal process of right clasper about as broad as long, truncate apically, the lower apical angle produced slightly ventrally to a sharp point; middle process of right clasper shorter and broader than in *pumilus,* the terminal process also broader and irregularly serrate; tubercle on the left side of dorsal margin of genital segment large and more flattened than in *pumilus.*

♀. Length 3.77 mm., width 1.7 mm. Head: width .71 mm., vertex .30 mm. Antennae: segment I, length .28 mm.; II, 1.04 mm.; III, .54 mm.; IV, .41 mm. Pronotum: length .69 mm., width at base 1.29 mm. Very similar to the male in color, puncturation and pubescence.

Holotype: ♂ May 23, 1918, Gainesville, Florida (C. J. Drake); author's collection. *Allotype:* same data as the type. *Paratype:* ♂, taken with the types "on *Cephalanthus.*"

Ceratocapsus husseyi n. sp.

Allied to *sericus* Kngt., but differs distinctly in the structure of the genital claspers; perhaps can be separated by the fuscous apex of the second antennal segment.

♂. Length 4 mm., width 1.57 mm. Head: width .79 mm., vertex .32 mm. Rostrum, length 1.43 mm., reaching to middle of hind coxae. Antennae: segment I, length .36 mm.; II, 1.28 mm., yellowish, fuscous on apical one-third; III, .67 mm., fuscous, narrowly yellowish at base; IV, (broken); second segment with slightly longer and more prominent pubescence than in *sericus*. Pronotum: length .78 mm., width at base 1.3 mm.

Color dark brownish black, inner half of clavus, narrow base of corium, embolium, and base of pronotum, more yellowish; legs uniformly pale yellowish. Membrane uniformly fuscous, paler within areoles and bordering cuneus. Clothed with two types of pubescence, dorsum set with rather long erect hairs, scutellum, clavus, and corium also bearing closely appressed, silvery scale-like pubescence. Genital claspers distinctive; left clasper with an erect, incurved acuminate hook at base; middle hook projecting distally, the apical half curved upward, semicircular, tapering gradually to a sharp point; the third and ventral hook follows edge of genital segment and in form very similar to that in *sericus*. Right clasper differs very little from that found in *sericus*.

Holotype: ♂ June 27, 1921, Ann Arbor, Michigan (R. F. Hussey); author's collection. This is the specimen that the writer described as allotype of *Ceratocapsus sericus* Kngt., but with the study of more material I am convinced that the male of *sericus* is the form described below.

Ceratocapsus sericus Knight, Hemiptera Conn., 1923, p. 530.

The male allotype is described as follows:

♂. Length 3.85 mm., width 1.6 mm. Head: width .78 mm., vertex .30 mm. Antennae: segment I, length .34 mm., pale yellowish; II, 1.29 mm., pale yellowish brown; III, .69 mm., reddish brown, pale at base; IV, .60 mm., dark reddish brown. Pronotum: length .73 mm., width at base 1.3 mm. Color, pubescence, and puncturation very similar to that of female. Genital claspers distinctive; left clasper with three prongs, the middle and dorsal prongs arising some distance from base, taking the form of a chela or pincer-like claw of crustaceans, the tips of each fork acuminate and curved slightly upward. Right clasper in the form of a simple hook, without branches but curved on apical half.

Allotype: ♂ July 26, 1925, Huntington, Long Island, New York (F. M. Schott); author's collection.

Ceratocapsus pilophoroides n. sp.

Suggestive of *Pilophorus* in form of head and prothorax, but differs from that genus in the thickened antennal segments and absence of scale-like bands.

♀. Length 3.4 mm., width 1.38 mm. Head: width .80 mm., vertex .86 mm.; eyes and form of head very suggestive of the genus *Pilophorus.* Rostrum, length 1.34 mm., reaching upon hind coxae. Antennae: segment I, length .26 mm., yellowish brown; II, 1.04 mm., tapering to slightly thicker apically, brown, slightly paler at base; III, .67 mm., brown; IV, .60 mm., dark brown. Pronotum: length .69 mm., width at base .97 mm.; disk convex and sides strongly sulcate as in *Pilophorus.*

Color yellowish brown to dark brown, hemelytra paler, dull to slightly pruinose, apical area of corium and the cuneus dark brown and shining; a moderately distinct pruinose band across middle of clavus and basal angle of corium, but without scales. Membrane pale or whitish, veins brown. Embolar margins sinuate, broader on apical area. Mesoscutum broadly exposed, declivent behind, scutellum small, convex apically; ostiolar peritreme white, size moderate. Venter dark brown, strongly shining. Clothed with simple, erect pubescent hairs, a few hairs longer than others, but without trace of scale-like pubescence.

Holotype: ♀, Topeka, Kansas (Popenoe); author's collection. This form is so distinct it may be recognized from the female sex.

Ceratocapsus neoboroides n. sp.

Resembles *Neoborus* in several respects, but distinguished by the thickened antennal segments and converging type of arolia.

♀. Length 3.2 mm., width 1.56 mm. Head: width .73 mm., vertex .35 mm.; frons granulate and finely punctate, median line impressed, the whole closely matted with silvery sericeous pubescence. Rostrum, length 1.08 mm., just attaining posterior margins of middle coxae. Antennae: segment

I, length .25 mm.; II, .67 mm., not equal to width of head; III, .39 mm.; IV, .36 mm.; yellowish to brownish. Pronotum: length .62 mm., width at base 1.25 mm.; calli distinct, granulate, darker in color than disk; lateral margins distinct, in fact the whole pronotum is very similar to that found in *Neoborus.*

Dorsum rather finely and closely fusco-punctate, vertex and calli granulate. Clothed with semi-erect, simple yellowish pubescence and closely intermixed with more recumbent, silvery, scale-like pubescence. Color yellowish to brown, calli brownish black, margins of scutellum and clavus, and the embolium paler. Legs yellowish, tibiae more brownish. Membrane and veins pale fuscous brown, paler on central area.

Holotype: ♀ April 20, 1926, Santa Cruz river, Pima County, Arizona (A. A. Nichol).

This species is so different from the known species of *Ceratocapsus* that it may be easily recognized from the female characters.

Ceratocapsus pilosulus n. n.

A new name to replace *Ceratocapsus pilosus* Knight (Hemiptera Conn., 1923, p. 526) which is preoccupied by *Ceratocapsus pilosus* Reuter (Öfversikt af Finska Vet.-Soc. Forhandlingar, xlvii, 1905, no. 20, p. 34), a species described from Venezuela.

TWO NEW NORTH AMERICAN SPECIES OF MUSCOID FLIES (TACHINIDAE, DIPTERA).

By H. J. Reinhard, College Station, Texas.

The two new species of Tachinidae described in the present paper are provisionally referred to the genus *Masicera* to which they trace in most available keys. Although Coquillett's interpretation of *Masicera* apparently is a complex, no satisfactory revision of the related North American genera has been made since his treatment of the subject in 1897.[1] The allocation of species belonging in this group remains uncertain until all of the genotypes concerned are studied and the genera adequately redefined.

Masicera unispinosa n. sp.

Male: Front at narrowest (before ocelli) 0.25 of head width (average of four, 0.26, 0.25, 0.25, 0.25); parafrontals gray pollinose, with fine black hairs outside of frontal rows; median stripe narrow above widening below to about one-half the parafrontal width, brownish-black; frontal bristles ten to twelve, the two (three in two specimens) uppermost large, reclinate, the lower ones diverging toward the eyes and extending nearly to middle of face; no orbitals; only one pair verticals (inner) developed; ocellars large, proclinate; face strongly receding, sides bare, densely gray pollinose, greatly narrowed below; antennae almost reaching oral margin, black, second joint sometimes faintly reddish at apex, hardly one-fourth the length of third; arista of moderate length, slender, slightly thickened beyond the short basal joints, indistinctly short pubescent; facial ridges strongly divergent, bare except close to vibrissae which are situated at the oral margin; facial depression gray pollinose reflecting blackish; proboscis short, fleshy; palpi ordinary, yellow usually infuscated basally, with long black hairs beneath and short bristles near apex above; cheeks gray pollinose on reddish ground color, with numerous black hairs, about one-fifth the eye height; occiput bearing fine pale hairs and black bristles on lower outer margins; eyes bare.

Thorax black, with gray pollen which has a slight yellowish tinge on mesonotum; with four distinct dark stripes, the outer ones interrupted at suture; scutellum black, densely gray pollinose except on basal third. Chaetotaxy: humeral, 3; posthumeral, 2; presutural, 2; notopleural, 2; acrostichal, 3, 2 to 4 (variable); dorsocentral, 3, 4; intraalar, 3; supra-alar, 3; postalar, 3 (inner one small); pteropleural, 1; sternopleural, 2, 1; scutellum with 1 discal, 3 lateral (anterior and posterior ones large) and 1 small decussate horizontal apical pair; halteres yellow, knobs pale above; calypters semitransparent, white with a pale yellowish tinge.

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[1] Revision of the Tachinidae, Technical Series Bulletin, No. 7, U. S. D. A., 1897, p. 113.

Abdomen black, broad at base but distinctly narrowed toward apex; segments two to four gray pollinose except on the shining hind margins and on a narrow but very distinct dark median stripe; second segment with the pollen extending down the sides and across the venter, which is highly polished posteriorly with dense patches of short black appressed hairs on last two segments; first segment wholly black, without median marginals; second with a median marginal pair; third with a marginal row of about ten; fourth with a marginal and irregular rows of shorter discals; genital segments small, yellowish, inner forceps shining black, slender with blunt tips, deeply divided but not divergent, base with long black hairs directed posteriorly; outer forceps lobelike with a broad yellow base, tapering beyond middle, tips black, broadly rounded, bearing very minute short stubby spines; fifth sternite yellow, widely and deeply incised, the lobes with a few long black hairs on the inner margins.

Legs black, claws and pulvilli elongated; middle tibia with one strong bristle on outer front side near the middle; hind tibia subciliate on outer posterior side with one long bristle slightly beyond the middle.

Wings slightly darkened along the costal border; costal spine indistinct; third vein with one large bristle near base, all others bare; fourth vein curving slightly inward beyond bend, which is obliquely rounded; first posterior cell narrowly open a short distance before the wing tip; hind cross vein sinuous, oblique to fourth, tip nearer bend than to small cross vein.

Length, 4.5 to 7.5 mm.

Described from nine males collected at College Station, Texas, April and May, 1920–1929, (H. J. Reinhard). Type and two paratypes deposited in the U. S. National Museum.

Masicera seticauda n. sp.

Male: Front 0.21 of head width, rather prominent below; parafrontals gray pollinose, blackish and subshining before vertex; median stripe broad, black, slightly narrowed in front of ocellar triangle extending as a line on either side to inner vertical; frontal bristles in two rows which diverge on the parafacials to a level with apex of second antennal joint, the uppermost pair smaller than the two preceding reclinate ones; inner verticals rather weak, the outer short and hairlike; ocellars large, proclinate; orbitals absent; eyes bare; parafacials gray pollinose, bare, strongly divergent, not narrowed below, distinctly wider than third antennal joint; face concolorous with parafacials, the ridges rather high, with a few bristles above the vibrissae, which are situated on the oral margin; antennae three-fourths the length of face, black except near the base of third and at apex of second joints which are yellowish; third joint slightly more than twice the length of second; arista bulbous at base, very slender beyond, basal joints short but distinct; proboscis very short, fleshy; palpi yellow, rather short and slender, with long black hairs beneath on apical half; cheeks about one-fourth the eye height; occiput subshining with thin gray pollen and sparse pale hairs intermixed with a few black bristles above and below.

Thorax black, dorsum subshining, with two wide pollinose stripes extending from a roundish spot at the anterior dorsocentral bristle to the base of the scutellum, the inner and outer stripes less distinctly defined, humeri densely gray pollinose; scutellum black, with reflecting thin gray pollen except on narrow base. Chaetotaxy: humeral, 3; posthumeral, 2 (outer one hairlike); presutural, 1; acrostichal, 3, ? 3 (obscured by pin); dorsocentral, 3, 3; intraalar, 3; supraalar, 3; postalar, 2; notopleural, 2; pteropleural, 1; sternopleural, 2, 1; scutellum with three pairs of lateral bristles, the posterior largest, divaricate, situated almost at apex, with fine hairs between them; disk pilose, with a pair of weak hairlike bristles shortly in front of the posterior marginals; halteres brownish-yellow; calypters white.

Abdomen slender, black tinged faintly with brown on the sides and venter; basal two-thirds of segments two to four with gray pollen, which on the intermediate segments extends broadly on the venter; an obscure median vitta present; hairs and bristles long and erect on dorsum; first segment with a median marginal pair; second with a discal and marginal pair; third with a discal pair and marginal row; fourth with a discal and a marginal row, and a dense series of long spiny bristles underneath on each side of the genitalia; in addition to the usual marginal laterals each segment has a single bristle in the middle forming a complete row on the sides of the abdomen; genital segments black; fifth sternite with a U-shaped incision, the lobes converging behind, black, bearing short black hair on the margins.

Legs slender, black, tarsi brownish beneath; claws and pulvilli elongated; middle tibia with one bristle on outer front side; hind tibia with a sparse row of short bristles on outer posterior side with one long near the basal third, the middle, and the apex.

Wings normal, slightly infuscated; third vein with three setules at base; fourth vein with a rounded obtuse bend, straight beyond curving slightly outward near tip so that the first posterior cell is narrowly open about half the length of hind cross vein before exact wing tip; hind cross vein sinuous, tip nearer bend than to small cross vein; costal spine short and indistinct.

Length, 6 mm.

Described from one male collected at College Station, Texas, April 9, 1918, (H. J. Reinhard). Type deposited in the U. S. National Museum.

The species is related to *Masicera polita* Coq. from which it differs in having yellow palpi, facial ridges bristly on less than lower fourth, three anterior acrostichals, etc. The dense row of bristles on each side of the fourth segment below makes it easily recognizable.

A NEW ARCTOCORIXA WITH A NOTE ON SYNONYMY (HEMIPT., CORIXIDAE).*

By G. Stuart Walley, Ottawa, Ont.

There appear to be two known species of *Arctorcorixa* in Northeastern America having the elytra conspicuously marked by three longitudinal blackish lines. Both have been commonly referred to as *A. trilineata* Prov., but the writer recently pointed out (Can. Ent., LXI, 34, 1929) that the true *trilineata* is restricted to the form having the elongate male pala with the "pegs" in a single row. The form with the shorter more rectangular pala with the "pegs" in two rows is a distinct species and examples studied by the writer differ in several important structural details from the species described by Provancher.

In 1771 (Novae Species Insectorum, Cent. I, p. 70) Forster described under the name *Notonecta lineata* a species of *Arctocorixa* having three longitudinal fuscous lines on the elytra. The locality data given by Forster, "in aquis provinciae Noveboracensis in America Septententrionali" is sufficiently vague to include the range of both the above forms. A study of the essential characters contained in Forster's description has led the writer to believe that Provancher's species is identical with *A. lineata* (Forst.). Beyond the fact that specimens of *trilineata* are slightly larger and strictly speaking have four to six instead of three transverse pronotal black bands there are apparently no distinguishing characters. Moreover the number of lines on the prothorax has been shown to vary slightly in *Arctocorixa*, thus in some specimens there are three broad median bands with narrower and shorter anterior and posterior bands so that the general aspect is distinctly three banded. The following synonymy is therefore proposed.

Arctocorixa lineata (Forst.)
  Notonecta lineata Forster, Nov. Spec. Ins. Cent. I, 70, 1771.
  Notonecta noveboracensis Gmelin *in* Linnaeus, Syst. Nat., edn. 13, 1, pt. 4, p. 2119, 1788 (unnecessary n. n. for *lineata* Forst.).
    Turton, Linnaeus, Syst. Nat. edn. 13, II, p. 605, 1806. Engl. tr.

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* Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Corisa trilineata Provancher, Nat. Can. IV, p. 108, 1872 (New Synonymy).
Corisa trivittata Provancher, Pet. Faune Ent. Can., III, p. 203, 1888 (unnecessary change of name).
Arctocorixa trilineata (Prov.), Walley, Can. Ent. LXI, 34, 1929.

The three lined form with the short pala with the "pegs" in two rows is a closely allied species but can scarcely be *lineata* since the pronotum bears six or seven regular transverse blackish bars and the yellow on the elytra is reduced so that the three longitudinal blackish marks are less stripe-like and the general aspect is scarcely pale flavous as stated by Forster. Since this species is apparently without a valid name it is described as follows:

Arctocorixa impersonata n. sp. (Figs. 1, 2, 3, 4, 5.)

Male.—Length 5.75 mm. Head from above broadly rounded in front. Vertex from above slightly longer than shortest distance between eyes. Inner posterior angles of eyes remote from occipital margin. Front with median oval depression almost as in *lineata,* just surpassing lower margin of eyes, in width as broad as greatest interocular space. Vertex smooth, shining, a few punctures as in *lineata.* Apical antennal segment slender, three-fifths as long as the much stouter sub-apical segment. Lateral lobe of prothorax as in fig. 5. Exposed disk of pronotum twice as wide as long, a short very faint carina at middle in front; posterior margin rather evenly curved with only a faint broad angulation at middle, surface shining, with fine shallow rastrations. Metaxyphus as in fig. 3, small, rather short with apex forming an angle of almost 90 degrees. Front femora oval in cross-section, stridular area large, extending well beyond middle beyond which is a dispersed patch of short stouter sub-erect setae. Tibiae about twice as long as broad, only bluntly carinate above. Palae as in fig. 1, rather short, sub-rectangular, thinner than tarsi without strong carina on outer face and with pegs on inner face in two rows, about eighteen in a row which begins near inner basal angle and runs outward and gradually upward in an almost straight line to end sub-marginally at about apical third of pala; a shorter marginal row of six or seven slightly longer pegs beginning on upper margin above and close to end of former row, continuing along curve of margin terminating distinctly before apex. Clavus distinctly and evenly rastrate throughout; corium with finer more confused rastrations becoming only obscurely roughened toward apex; corium with very fine sparse appressed yellowish hairs. Strigil small with three striae. Right clasper slender gradually curved, very slightly broader before the short pointed apex.

Color pattern simulating *A. lineata* but with black markings predominant. Head, legs, thoracic pleura and venter (except for brown mesosternum), dull yellow. Pronotum with ground color dull yellow, disk narrowly blackish margined behind and with six or seven almost regular transverse blackish bars which are slightly broader than the yellowish interspaces. Clavus predominantly blackish with the yellowish intervals narrower than the transverse blackish bars, the latter extending transversely from outer to inner margins with their bases fused along inner margin. Corium with three broad longitudinal blackish stripes separated by narrower more broken series of vermiculate yellowish flecks. Embolar margin broadly fuscous yellow; a yellow dash separating corium from membrane area, the latter with a circumferential row of blackish flecks which fuse outwardly, also a rather broad median longitudinal vermiculate blackish patch joined in places with the marginal flecks. Venter of abdomen yellowish brown with basal three and lobes of last ventral darker brownish, pale margined.

Female.—Slightly more robust than the male. Palae stout, not more than two and one-half times as long as broad. Color pattern as in fig. 2.

Holotype.—♂, Fairy Lake, Que., Sept. 11, 1928, (G. S. Walley); No. 3180 in the Canadian National Collection, Ottawa, Ont.

Allotype.—♀, same data as holotype.

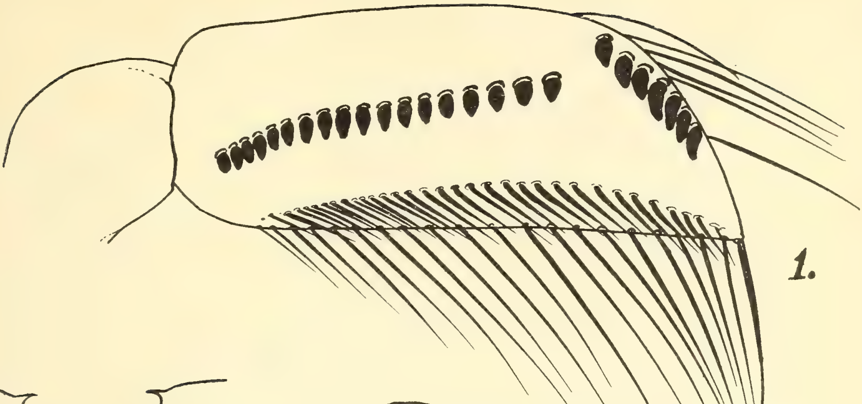
Paratypes.—3 ♂ ♂, 4 ♀ ♀, Fairy Lake, Que., May 17, 1927, (Walley); ♂, Fairy Lake, Oct. 2, 1927, (Walley); 6 ♂ ♂, 2 ♀ ♀, Fairy Lake, Sept. 9–11, 1928, (Walley and Brown); 3 ♂ ♂, 2 ♀ ♀, Rideau River, Ottawa, Ont., Apr. 16, 1927, (Walley); 5 ♂ ♂, 2 ♀ ♀, Rideau River, Ottawa, Nov. 15, 1928, (Walley); 6 ♀ ♀, Merivale, Ont., May 9, 14, 1930, (Walley); ♂, ♀, Orono, Maine, Apr. 20, 1912, (H. M. Parshley); 2 ♀ ♀, Orono, May 6, 1914, (Parshley); ♂, Ithaca, N. Y., July 18, 1919.

Holotype, Allotype and Paratype in Canadian National Collection, Ottawa. Paratypes in collection of Mr. J. R. de la Torre-Bueno, White Plains, N. Y.

Notes.—Traces to *A. trilineata* (Prov.) = *lineata* (Forst.) in keys to species of *Arctocorixa.* Differs from *lineata* in arrangement of palar pegs; the interocular space on vertex is noticeably narrower in *impersonata;* the apical antennal is three-fifths as long as sub-apical not half as long as in *lineata.* The lateral prothoracic lobe in *lineata* (fig. 7) is slightly narrower and more elongate and the metaxyphus while not large in either species is distinctly more acutely pointed in *lineata* (fig. 6). The front femur of the male is broader basally and somewhat flattened on inner basal area in *lineata,* in *impersonata* it is more ovate in cross-section. The female pala of *lineata* is at least three times as long as broad compared with two and one-half times in *impersonata.* The male strigil of the latter has only three striae, in *lineata* five. The male clasper (fig. 4) differs slightly and has the apex broader than in Forster's species which is usually as in fig. 6 (Can. Ent. LXI, 35, 1929) though in some specimens of *lineata* the small curved apex is less pronounced. The elytra of *lineata* are a little more heavily rastrate and the blackish pronotal bars a little less regular and slightly narrower. The elytral pattern of *impersonata* differs in having the yellow markings much less pronounced so that the three corial black stripes are not as sharply delimited as in *lineata.* In *impersonata* the yellow is reduced to longitudinal series of flecks not entire stripes as in *lineata.* The mid tarsus also lacks the narrow brown apex found in *lineata.*

EXPLANATION OF FIGURES.

Arctocorixa impersonata n. sp. 1. pala of male; 2. dorsal view showing color pattern; 3. metaxyphus; 4. right clasper of male, 5. lateral lobe of prothorax. *Arctocorixa lineata* (Forst.) 6. metaxyphus; 7. lateral lobe of prothorax.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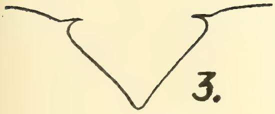
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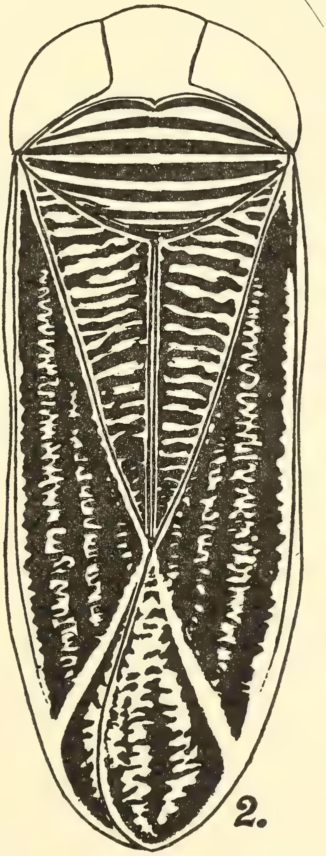
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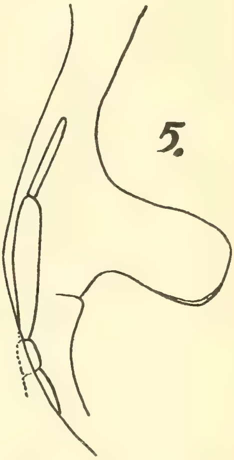
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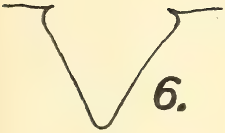
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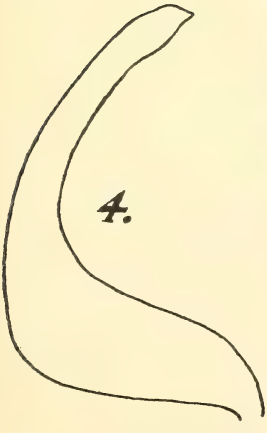
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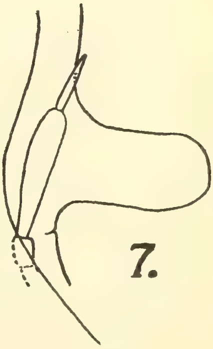

7.

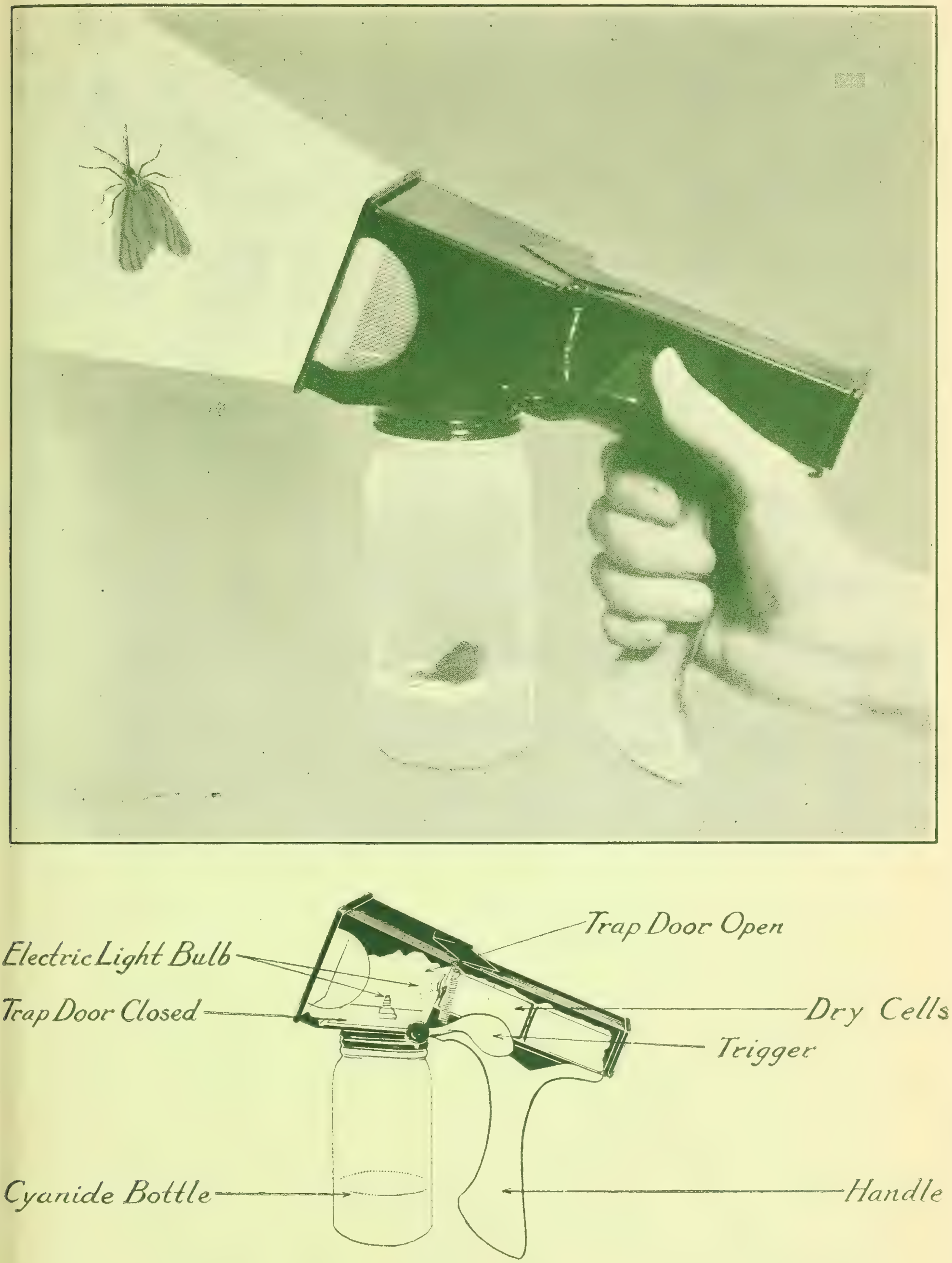
A NEW MOTH COLLECTING GUN.

By J. D. Gunder, Pasadena, California.

The illustration shows the general principle and mechanical construction of this moth collecting device probably better than a lot of description. I have termed it a "gun" because of its suggestive shape and single-handed operation. There is every reason to believe that it can be used for capturing specimens in certain other orders of insects as well as Lepidoptera.

When a desired moth is seen resting on a lamp-post, wall or lighted sheet, you simply put the mouth of the gun over the specimen, having pressed the trigger which opens the trap-door of the bottle and the insect flies inside. With the pressure on the trigger a small electric bulb illuminates the object and the interior of the bottle. The release of the trigger prevents the escape of the catch. The object of the light is to view any individual before capture to see if you really want it and also to cause it to flutter back into the gun and down into the bottle where it can be seen in time for the release of the trigger. The electric lighting feature is not intended to lure distant moths to a collector, but is simply a great help in finding and examining specimens in dark corners and in getting them unharmed into the killing jar. The old way of bottling moths was to rapidly remove a big cork stopper and put the opening of the container sideways over a specimen and then by a sleight-of-hand performance, get the cork back in before the captive flew out. This operation required both hands and sometimes valuable specimens escaped or were otherwise damaged. The single-handed operation of this gun can be appreciated because it leaves the left hand free for self support or otherwise climbing around. Cyanide, ether or any killing agency can be used in the bottle which readily unscrews from the base of the gun. All metal parts are well constructed of light material and lacquered black. Two standard dry cells are required and are as easily replaceable as those in a flash light.

This gun will be found very useful to all collectors and especially to those going into the tropics or making short summer trips to distant points where time is valuable and the best kind of an entomological equipment required.


Trap Door Open
Electric Light Bulb
Trap Door Closed
Dry Cells
Trigger
Cyanide Bottle
Handle

A New Moth Collecting Gun—Gunder

[PATENT PENDING]

SYNONYMIES OF ANTILLEAN CHRYSOMELIDAE, WITH DESCRIPTIONS OF NEW SPECIES.

By Doris H. Blake, Bureau of Entomology, United States Department of Agriculture.

I.

The Species of Disonycha now included under D. pensylvanica.

While identifying material of Cuban Chrysomelidae collected by Mr. S. C. Bruner of Santiago de las Vegas, Cuba, I was struck by the resemblance of *Disonycha costipennis* to the Florida form, *Disonycha pensylvanica* var. *conjugata.* Mr. H. S. Barber, to whom I showed the specimens, informed me that he had long thought the two were identical. The notes here presented are the result of an attempt to dispel the confusion that has existed among the species allied to *D. pensylvanica,* and at present wrongly synonymized with it. The writer wishes to express her gratitude to Mr. K. G. Blair for searching for types of *Disonycha* in the British Museum.

The present status of *Disonycha pensylvanica* as given in Leng's catalogue is that six names are listed as synonyms or varieties under *"pennsylvanica." Pensylvanica,* as it was originally spelled by Illiger,[1] was described in 1807, and *conjugata,* included as a variety, was described by Fabricius in 1801.[2] If the two were only varietally distinct, *conjugata* would, of course, be the valid name. The other names in the order of their publication are: *uniguttata* Say 1825,[3] *vicina* Kirby 1837,[4] *limbicollis* LeConte 1857,[5] *pallipes* Crotch 1875,[6] and *procera* Casey 1884.[7]

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[1] Illiger, Mag. f. Insek., vol. 6, 1807, p. 146. In the 18th century the name Pennsylvania was ordinarily spelled "Pensylvania."

[2] Fabricius, Syst. Eleu, vol. 1, 1801, p. 405.

[3] Say, Journ. Acad. Philadelphia, vol. 4, 1825, p. 88.

[4] Kirby, Fauna Boreali Amer. vol. 4, 1837, p. 217.

[5] LeConte, Rept. of Exp. & Surv. Miss. to Pac., vol. 12, pt. 3, 1860 (printed in June 1857), p. 67.

[6] Crotch, Proc. Acad. Philadelphia, vol. 25, 1875, p. 64.

[7] Casey, Cont. to Descr. and Syst. Coleop. of N. A., pt. 2, 1884, p. 182.

These names were originally grouped under one species (*pensylvanica*) by Horn, who has been followed by subsequent workers, probably because the group as a whole possesses a single rather striking feature, the costate, parallel-sided elytra. As shown by the shape and structure of the aedeagus, as well as by external characters, there are at least four distinct species besides *conjugata*. The following key will assist in their identification.

KEY TO SPECIES OF DISONYCHA FORMERLY INCLUDED UNDER PENSYLVANICA.

1. Elytra pale yellowish or reddish brown with paler yellow vittae, often indistinct. "Carolina," Florida, Cuba. *conjugata*

   Elytra black with pale yellow vittae 2
2. Front of head, with exception of socket of basal antennal joint, black (in *limbicollis* sometimes a narrow pale line at base of front on clypeus); ventral surface, except for tip of abdomen, and legs entirely black 3

   Lower part of front of head, usually femora and margin of abdomen pale or reddish 4
3. Small (4–6 mm.), elytra very finely punctate, sometimes almost impunctate, in female distinctly costate; black vittae usually joined at apex. East of Mississippi, frequent in southern Atlantic States .... *pensylvanica*

   Larger (6–7.5 mm.), elytra distinctly punctate, in female not costate or only very indistinctly so; black vittae rarely joined at apex. California .... *limbicollis*
4. Prothorax usually with large median spot considerably wider anteriorly, and two generally less pigmented lateral spots, the two lateral spots on well-marked knobby callosities; elytra distinctly punctate, only faint trace of eltyral costae in female; aedeagus broad, not acutely tipped (see fig. 7); larger (6–8 mm.). United States east of Rockies. *uniguttata*

   Prothorax usually with only faint traces of five small spots, these occasionally darker and sometimes banded together; only indistinct traces of callosities; elytra indistinctly punctate, in female costae well marked; aedeagus acutely tipped (see fig. 6); smaller (5–7.5 mm.). United States east of Rockies .... *pallipes*

Pensylvanica, as described by Illiger, stands out as a distinct species. He described it as 2 lines long, of the build of *glabrata,* shining, black with the roots of the antennae, or its small sunken base, and the last ventral segment pale; the prothorax pale with a black median spot, rounded in front, narrowed behind. The elytra were unpunctured, black with two narrow pale vittae joining at apex, the legs black. Although said to have been taken in Pennsylvania, it was sent by Bosc from Carolina with other specimens. This description fits perfectly the small southern *Disonycha,* specimens of which are in the National Museum from Texas, Louisiana, Florida, Virginia and Maryland. The distinctive characters separating it from other costate species in the East are: The small size, the head entirely black except for the pale circle about the base of the antenna, the median black spot on pronotum, somewhat variable in size, the wide black elytral vittae joining at the apex, the black ventral surface except for the last ventral segment, and the black legs, and lastly the punctation, which is extremely fine, giving the insect the shiny appearance of *glabrata.* The aedeagus (see fig. 5) is unlike that of *conjugata.* This is probably the species mentioned by Horn as a form of *pensylvanica* occurring in Florida and Louisiana. It is probably also what Blatchley has described as var. *parva,*[8] although I have seen no specimens from as far north and inland as Knox Co., Indiana.

D. conjugata Fabricius, described from "Carolina, Mus. Bosc," is the most readily recognized species of the group on account of its pale coloring. Fabricius described it as having the head, thorax and elytra ferrugineous with two pale yellow elytral vittae joined at the apex, and the antennae, metasternum and tibiae black. Fabricius does not mention the costate elytra, but since the costation is most marked in the female and in the male is indistinct or obsolete, this omission is of slight significance. Olivier's figure[9] shows it to be what is commonly labelled *conjugata* in collections.

The Cuban *D. costipennis,* described by Duval under the genus *Monomacra*[10] is unquestionably identical with *conjugata.* Duval's description differs from that of Fabricius in that there is no mention of the pale elytral vittae, and the color of the antennae and tibiae is given as fuscous. Examination of a series of specimens shows that the paler vittae are sometimes indistinguishable on the pale reddish brown elytra, particularly in darker or more greasy specimens, and that the darker coloring of the antennae, metasternum, and tibiae is a matter of individual variation. Dissection shows the aedeagi to be the same in both (see fig. 4). The species has been collected by E. A. Schwarz on *Polygonum,* and is definitely known from Florida and Cuba, in addition to Fabricius' " Carolina " record.

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[8] Blatchley, Journ. N. Y. Ent. Soc., vol. 29, 1921, p. 16.

[9] Olivier, Ent., vol. 6, 1808, pl. 2, fig. 30, p. 686.

[10] Ramón de la Sagra, Hist. de la Isla de Cuba, vol. 7, 1856, p. 129.

Disonycha pallipes Crotch was briefly described as having the elytra yellow with black vittae, the head black, and the "hind femora at least and part of the body red." No types seem to have been labelled as such and no type locality was recorded. Mr. Nathan Banks, of the Museum of Comparative Zoology, reports that there is no specimen under this name in the LeConte collection, and Mr. K. G. Blair, who has kindly searched through the collection at the British Museum, reports that there is none there or at Cambridge, England, where the Crotch collection is preserved. Dr. E. A. Schwarz, with whom Crotch was working at the time he wrote his key to *Disonycha,* has labelled as var. *pallipes* specimens in the National Museum from Michigan which agree with Crotch's brief key description, and Mr. Charles Schaeffer has labelled similar specimens as *pallipes* in the Brooklyn Museum collection. The specimens so labelled are slightly larger than *pensylvanica* (5–7 mm.), and the head is dark with a pale lower front. The prothorax is often immaculate or with only faint traces of five small spots, two lateral and three forming a triangle medially, the middle lower one being elongate. Occasionally all of these spots are well marked and sometimes even coalesce. The elytra are very finely punctate, and in the female the costae are well marked; the black elytral vittae are not ordinarily united at the apex as in *pensylvanica.* The femora and margin of the abdomen are almost invariably pale or reddish. The aedeagus (see fig. 6) resembles somewhat that of *conjugata,* although quite distinct. This species occurs from Massachusetts and New York southward to Florida and Texas and westward through Indiana, Wisconsin and North Dakota, even to Nevada. I have found it in Washington, D. C., feeding on *Polygonum.*

Disonycha procera Casey, described from Delaware, is identical with *pallipes.*

Disonycha uniguttata was described by Say in a publication on the insects collected on an expedition to the Rocky Mountains, and the type locality is given as the "United States." It is probable that the specimens were collected somewhere between the Mississippi and Colorado, possibly along the Platte River.[11] Say described the species as more than a quarter of an inch long, black, with the front of the head and thorax rufous, the latter with a large central spot sometimes connected with a smaller yellowish or pale spot on each side; the elytra obsoletely punctate with two vittae joining at the tip, the femora and margin of the abdomen rufous. This is the largest of the group (6–8 mm.), and the elytral punctation, while not conspicuous, is very much more pronounced than in any of the others except *limbicollis* Lec. Like *limbicollis,* the prothorax has a distinct lateral callosity on either side. The pale elytral vittae are wider than in *pensylvanica,* and there is little indication of costae, even in the females. The aedeagus (see fig. 7) is quite unlike that of *conjugata, pensylvanica* or *pallipes.* In fact the aedeagus resembles closely that of *limbicollis,* although differing in minor details from that species. This species is widespread, occurring from Canada to Virginia along the Atlantic coast, and west through Indiana, Illinois and Michigan. It has been collected by C. A. Frost on *Polygonum.*

Disonycha vicina Kirby may from description be either *uniguttata* or *pallipes,* but must remain a doubtful species, since the single specimen from which it was described is not to be found. Mr. K. G. Blair of the British Museum writes as follows:

> "Of this we should have the type, and we have a specimen bearing the original registration label of the type, but without any determination label. It does not agree with the description by Kirby, but is a normal specimen of *D. caroliniana* F. It would appear that there has been some transference of the registration label in the past, and that the type is now lost."

Limbicollis LeConte was described (from Sacramento, California) as black with pale margin, and with two pale elytral vittae wider than in *pensylvanica,* and with the elytra not sulcate. This description corresponds with specimens in the National Museum collected in California. The head is entirely dark (sometimes a narrow pale line extends along the clypeus at the base of the front), a wide band leaving only a pale margin extends across the prothorax, and the ventral surface and legs are black. The punctation is similar to that of *uniguttata.* The aedeagus (see fig. 8), however, while similar, differs in several details. It is probably a distinct race, although closely allied to the eastern *uniguttata. Limbicollis* and *uniguttata* belong to a totally distinct group from the others listed under *pensylvanica.*

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[11] Barber, Ent. News, vol. 39, 1928, p. 15.

On other species, the Central American species *D. recticollis* Jacoby,[12] belongs to this group with costate elytra. It is very similar in size, coloring and punctation to *D. pallipes,* but usually paler. The head has only a dark basal band across the occiput, connecting narrowly with the eye on either side. The prothorax is usually immaculate or with traces of two darker spots anteriorly, and occasionally vestiges of the other two lateral spots and the median streak. The dark elytral vittae are narrower than in *pallipes,* and in the male there is little or no trace of costae, while in the female there is only one ridge, and that on the median black vitta, in contrast to the several costae of *pallipes.* The antennal joints are also different from those of *pallipes.* Like *conjugata, uniguttata,* and *pallipes,* it has been collected on *Polygonum,* specimens in the U. S. N. M. collection being labelled as so found at Porto Bello, Panama, by E. A. Schwarz.

II.

New West Indian Chrysomelidae.

The present paper is mainly the result of an attempt to identify a box of miscellaneous Chrysomelidae sent to me by Mr. S. C. Bruner, of Santiago de las Vegas, Cuba. Mr. Bruner collected most of the new species here described in the Sierra Maestra in the Province of Oriente, Cuba, a region in which little or no entomological collecting had been done before. The writer wishes to express her gratitude to him for the generosity with which he has supplied specimens and geographic data.

Metachroma adustum Suffrian.

Metachroma terminale Horn, Trans. Amer. Ent. Soc., vol. 19, July, 1892, p. 215.

Specimens collected by E. A. Schwarz at Biscayne Bay and Key West, Florida, were described by Horn as *Metachroma terminale.* The substance of his short description differs in no way from the long and detailed one of Suffrian,[1] based on Cuban material, except that Horn described the head as "sparsely punctate, slightly opaque," and Suffrian as thickly and finely punctate. Both the Cuban and Floridan specimens have the head moderately densely punctate, with an alutaceous surface more pronounced on the lower half of the front. The species apparently is known from the mainland only at the very tip of Florida. Since working out the identity of the two I have found that Dr. Schwarz had previously noted it on pinned labels in the collection. Specimens sent by Mr. Bruner were collected at Hershey and Santiago, Cuba.

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[12] Jacoby, Biol. Centr.-Amer. Coleopt., vol. 6, pt. 1, 1884, p. 313.

[1] Suffrian, Archiv. f. Naturg., vol. 32, 1866, p. 339.

Chalcosicya new genus.

Oval, convex, with thin, usually coarse and appressed pale pubescence and with coppery body luster. Head inserted well into the prothorax, and eyes partially covered below by thoracic episternum; no supraorbital grooves; eyes somewhat emarginate. Antennae slender, gradually thickened apically, about half the length of body, second joint not noticeably shorter than third. Prothorax not quite twice as broad as long, not contracted at the base, distinctly margined and not dentate; episternum with anterior margin usually a little produced, although sometimes nearly straight, but never emarginate. Elytra broadly ovate, with lateral ridges behind humeri in the female of some species, confusedly punctate, sometimes obsoletely striate. Femora not toothed, tibiae not emarginate, the claws acutely denticulate at base.

Type of genus: *Chalcosicya maestrensis* new species.

Because of its coarse, almost squamulose pubescence, its distinctly margined but not denticulate prothorax, and its produced prothoracic episternum, this genus is most closely related to *Glyptoscelis.* It differs from that genus by its much smaller size and oval shape, its sparser pubescence, its wider prothorax, which is not contracted at the base, its broader, more oval elytra, and its differently shaped aedeagus. It is more like *Colaspidea* in size, but differs from that genus in shape in the same way as from *Glyptoscelis.* In both size and shape it resembles superficially the genus *Nodonota,* but the deeply inserted head, the long second antennal joint, and the pubescence, as well as other characters, separate it from this genus. It is distinct from *Graphops* and *Metachroma* on account of the lack of supraorbital grooves. The South American genus *Sphaeropis* has an entirely differently shaped episternum which does not at all cover the lower part of the eyes.

Chalcosicya maestrensis new species (Fig. 1.)

> Oval, shining, coppery, head and prothorax with sparse coarse pubescence, elytra less conspicuously pubescent, pronotum and elytra rather coarsely and thickly punctate. Head without callosities, a rather indistinct vertical fovea ending in a slight depression above clypeus; pronouncedly alutaceous with coarse punctation tending to become elongate and form wrinkles on occiput; with long coarse gray pubescence, not dense. Antennae slender and extending about half length of body, gradually thickened apically, the first three joints pale, next four becoming darker brown, eighth and ninth pale, and last two joints dark, second joint not noticeably shorter than third. Prothorax not quite twice as broad as long, with arcuate sides, not constricted at base, coarsely and moderately densely punctate, distinctly alutaceous, yet shining; with scattered long pale pubescence, thicker at the sides yet nowhere dense. Scutellum small, half elliptic. Elytra convex, broadly oval, with lateral ridges behind the humeri in female; surface shining, coarsely and rather closely and confusedly punctate, tending towards striation apically; not at all alutaceous; with very short, pale, coarse pubescence scarcely apparent on basal part of elytra, and becoming slightly longer apically; longer closely appressed pale hairs along lateral and basal margin and humeral depression, never dense. Body beneath reddish brown with coppery glints on femora and metasternum, metasternum coarsely punctate, ventral surface and legs with long appressed pale, not dense, pubescence. Claws with sharp basal tooth.
>
> Length, 3.5 to 4.5 mm.; width, 2 to 2.5 mm.

Type-locality.—Summit of Pico Turquino, Sierra Maestra, altitude 1,375 to 1,525 m., Province of Oriente, Cuba, collected by S. C. Bruner and C. H. Ballou, July, 1922.

Type (♀) and 5 *paratypes* (2 ♀, 3 ♂).—Cat. No. 43114, U. S. N. M. 1 paratype in collection of S. C. Bruner.

This is one of the largest of a group of several small species, apparently confined to the West Indies, of which *nana,* hereby assigned to the same genus, is the only one hitherto described. *Nana* was placed by Suffrian under *Heteraspis* of LeConte. LeConte afterwards, discovering the earlier use of the name *Heteraspis* by Blanchard for an oriental genus, replaced it by the name

Graphops. *Nana* can not be referred to LeConte's genus *Graphops* on account of the lack of any supraorbital sulcus on the head, and Clavareau in Coleoptorum Catalogus has referred it to the genus *Glyptoscelis.* The North American species of *Glyptoscelis* and the Venezuelan *G. aeneipennis,* which also extends to Trinidad and Grenada, are much larger insects, and in habitus bear little resemblance to the small West Indian species. Neither does the West Indian group resemble the small southwestern genus which Horn has referred to the Mediterranean genus *Colaspidea.* The prothorax is differently shaped from that of either *Colaspidea* or *Glyptoscelis.* It is nearly twice as broad as long, much wider than in typical *Glyptoscelis,* with lateral margins broadly arcuate, and not contracted at the base, and the elytra are wider and more oval, thus producing a more oval and less oblong shaped insect.

Galerucella maculipes new species (Fig. 9.)

Elongate, subparallel, rather coarsely punctate and finely pubescent, elytra with callosities at base, postmedianly and anteapically; pale yellow brown with dark antennae, head with median dark line, pronotum 7-spotted, elytra with ten narrow dark brown vittae, third and submarginal vittae more or less evanescent, and all obscure at apex, femora and often tibiae with dark median spot. Head densely and coarsely punctate, with fine appressed pubescence, pale with darker mouthparts, and with a median dark line down front, and often a black spot behind the eye at base of head. Antennae extending nearly to middle of elytra, dark brown, third joint longer than the others. Prothorax barely twice as broad as long, obtusely angulate on lateral margin; densely and coarsely punctate, with fine appressed pubescence; spots dark brown or piceous, small and usually seven in number, often contingent, these probably representing three large spots, one median, and two lateral, broken up. Scutellum pale, truncate. Elytra subparallel, narrowed in apical fourth, with blunt apex, a distinct basal callosity near scutellum on each elytron, another slightly below middle near suture, and the third at apical fourth, the last the most pronounced; surface densely and coarsely punctate and densely pubescent with short appressed hairs becoming very dense at apex; pale, with five narrow dark brown vittae on each elytron, suture and margin pale, the third and submarginal vittae frequently interrupted and all disappearing before apex, leaving apex pale. Body beneath pale, the femora and often the tibiae with a median dark spot.

Length, 5.2 to 6 mm.; width, 2 to 2.3 mm.

Type-locality.—Summit of Pico Turquino, 1,100–1,300 m. altitude, Sierra Maestra, Province of Oriente, Cuba, collected by S. C. Bruner and C. H. Ballou, July, 1922.

Type (♂) and 3 *paratypes* (2 ♀, 1 ♂). Cat. No. 43115, U. S. N. M. 1 other paratype in collection of S. C. Bruner.

In shape, elytral callosities and markings this species is very similar to *Trirhabda obscurovittata* Jacoby[2] of Central America, which was placed in the genus *Trirhabda* probably because the third antennal joint was shorter than the fourth, although other characters, among them the shape of the aedeagus, clearly indicate that it does not belong to that genus. It is considerably larger (8 mm. or more) and also has wider and fewer vittae than the Cuban species. *Maculipes* has the third antennal joint distinctly longer than the fourth, and so for the present must be referred to the genus *Galerucella.* It differs from other species of *Galerucella* described from tropical America by the rather unusual maculation of the femora and tibiae.

Stoiba indivisa new species (Fig. 2.)

Oval, faintly shining; head, prothorax, antennae and legs pale yellow, elytra deep blue, ventral surface black. Head usually visible from above, pale yellow with darker mouthparts, surface alutaceous, with a few coarse punctures, a fine median line down vertex. Antennae not longer than prothorax, pale yellow, first four basal joints subglabrous and slender, remaining joints gradually thickened and pubescent. Prothorax somewhat emarginate anteriorly, sides not arcuate, but much widened in a straight line three-quarters their length, thence slightly narrowed to base, twice as broad as long at widest point; explanate margin wide, basal margin sinuate, disk slightly convex with fine median line; surface alutaceous, with fine scattered punctures. Scutellum black, polished. Elytra convex, rounded, widest before middle, with prominent humeri but lacking the lateral sulcus and margin characteristic of *flavicollis;* surface alutaceous, dimly shining, with moderately coarse, dense punctation. Wings fully developed, body beneath black, shining, legs except at base entirely pale yellow, claws with distinct but short basal tooth.

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[2] Biol. Centr.-Amer. Coleopt., vol. VI, Pt. 1, 1886, p. 486.

Length, 6 to 8 mm.; width, 5 to 6 mm.

Type (♀).—Cat. No. 43116, U. S. N. M. Paratype (♂), also collected at Guantánamo, in collection of American Museum of Natural History, New York.

Type locality.—Guantánamo, Cuba, collected by W. M. Mann.

This species, while closely related to *flavicollis,* differs from it by its deep blue elytra, its coarser punctation, and by its lack of elytral sulcus, which in *flavicollis* distinctly divides the rounded arch of the elytra from the margin.

Stoiba bruneri new species. (Fig. 3.)

Head, prothorax, antennae except for the last joint, which is deep brown, and legs reddish yellow, elytra deep purplish blue, body beneath black; not shining, prothorax and elytra with broad rounded margin, elytra strongly convex. Head barely perceptible from above in shallow emargination of anterior prothorax, pale reddish with dark mouthparts, alutaceous with a few punctures bearing fine hairs, a median vertical line and a supraorbital depression across vertex, eyes widely set. Antennae slender, apical joints gradually thickened, first and third joints longest, fourth shorter and a little longer than fifth, these first five basal joints not heavily pubescent, remaining joints broader and densely pubescent. Prothorax over twice as broad as long, widest in the middle, very slightly emarginate anteriorly with wide arcuate explanate lateral margins, broadly curving upwards, disk slightly convex with fine median line, basal margin sinuate, pointing down at basal angles and at scutellum. Scutellum shining black. Elytra strongly convex, with rounded explanate margin widest before middle, diminishing to apex; surface alutaceous with fine not dense punctation; entirely deep purplish blue. Wings vestigial. Body beneath dark and shining, legs entirely pale except at base, claws with a strongly marked basal tooth.

Length, 7.5 to 9 mm.; width, 6 to 7.8 mm.

Type and 6 *Paratypes.*—Cat. No. 43117, U. S. N. M. 2 other paratypes in collection of S. C. Bruner.

Type locality.—Sierra Maestra, altitude 1,380 m., Province of

Oriente, Cuba, collected by S. C. Bruner and C. H. Ballou, July, 1922.

The identity of Klug's *Cassida flavicollis* (*Himatidium nigripenne* Sturm Catal.),[3] the type of Spaeth's genus *Stoiba,* is doubtful. There are several very similar species of this group occurring in Cuba. Suffrian, in his description of *Chelymorpha flavicollis,* mentioned another form, without naming it. Spaeth, in describing the genus *Stoiba* from specimens of *"flavicollis,"* probably had in hand the small rounded species with very dark elytra and pale yellow antennae, which is represented in the National Museum collection by specimens from Havana and Pinar del Rio, on the northwestern end of the island. It is quite probable that this was the species originally described by Klug. Taking this to be the case, the present species, while usually larger and not so rounded, and with more angular elytral side margins, resembles *flavicollis* somewhat in coloring, although the elytra are deep purplish blue as contrasted with Klug's description of black elytra, and the color of the head, prothorax, antennae and legs is not pale yellow but distinctly reddish. The shape of the prothorax is very different also from that of *flavicollis,* in which the lateral margin is not rounded anteriorly, and is widest near the base. Spaeth, in the key in which he described the genus *Stoiba* distinguished the genus by having the fifth antennal joint like the apical joints and not slender and subglabrous like the basal joints. In *Stoiba bruneri* the basal joints are longer and more slender than the corresponding ones of *flavicollis,* and the fifth joint is not so thick or so densely pubescent as the apical joints. The last joint is deep brown. Neither *bruneri* nor the following species, *decemmaculata,* if the genus is based entirely on the length and shape of the antennal joints belongs to the genus *Stoiba* as Spaeth originally described it. In his original description[4] he stated that he had no material of *Cassida swartzii* Thun. of Jamaica, or of *Chelymorpha angusticollis* Suff. of Cuba, and he then included them somewhat doubtfully, but later in Coleoptorum Catalogus he put them without question in the genus *Stoiba.* *Swartzii* and *flavicollis* are similar in having the fifth antennal joint short and pubescent and more like the apical joints, but *angusticollis, bruneri* and the following species, *decemmaculata,* have the fifth antennal joint intermediate in character between the basal and apical joints, and neither as pubescent nor as thick as the apical joints. In all three species, too, the wings are only vestigial, which is not true of all the specimens of *flavicollis.* Two specimens doubtfully referred to *flavicollis* in the National Museum collection with very bright blue elytra are also wingless.

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[3] Klug included this name in his original description, but no mention of its synonymy is found in Spaeth's treatment of the Cassidae in the Junk Catalogue.

[4] Spaeth, Deut. Ent. Zeitschr., 1909, p. 720.

Stoiba decemmaculata new species. (Fig. 11.)

Prothorax and elytra with wide lateral margin, elytra strongly convex; not shining, pale yellow, each elytron with two lateral-marginal and three median black spots, antennae, mouthparts, coxae, trochanters, joints of legs, tarsi and last ventral segment dark. Head somewhat apparent from above in slight emargination of anterior prothorax, but the widely separate eyes nearly concealed; a distinct median groove down front, and a supraorbital depression across vertex; surface alutaceous with a few coarse punctures, each one bearing a pale silky hair. Antennae not longer than prothorax, dark brown, basal joints slender, first and third joints about equal and longest, fourth, fifth and sixth shorter and diminishing gradually in length, fifth and sixth becoming wider and more pubescent,and remaining joints wider and densely pubescent. Prothorax barely twice as broad as long, widest in the middle, with broad lateral upward curving explanate margin, anteriorly shallowly emarginate over occiput of head, broadly arcuate on sides, and constricted somewhat at base, forming a sharp basal angle, basal margin sinuate; disk feebly convex, an indistinct median line more evident in middle; surface alutaceous with scattered, very fine punctation. Scutellum small, polished. Elytra strongly convex with broad explanate margin, widest behind basal angle, diminishing to apex; surface alutaceous with coarse dense punctation; each elytron marked by five black spots, the first elongate and in middle of base, the second median on height of elytron, and third on downward curve behind middle; the first lateral extending from margin half up the arched side of elytron, and second lateral near apex, also extending somewhat up the side. Wings vestigial. Body beneath more shining and lightly pubescent, the darkened coxae, joints, tarsi and last ventral segment giving a spotted appearance to the lower surface. Tarsal claws with a broad, blunt and short basal tooth, not at all conspicuous.

Length, 7 to 8.5 mm.; width, 6 to 7 mm.

Type (♀) and 2 *paratypes* (♂, ♀).—Cat. No. 43118, U. S. N. M. 1 paratype in collection of American Museum of Natural History, New York.

Type-locality.—Sierra Maestra, altitude 1,070 to 1,350 m., Province of Oriente, Cuba, collected by S. C. Bruner and C. H. Ballou, July, 1922.

Other localities.—Pico Turquino, Cuba, altitude 1,525 m.

Like the preceding species, *S. bruneri,* this species does not fit into the key in which Spaeth originally described the genus *Stoiba,* because the fifth antennal joint is intermediate in character between the basal and the apical joints. On the other hand, while *bruneri* resembles *flavicollis* in coloration and sculpture, *decemmaculata* and *angusticollis* are both pale yellow species with similar coarse, dense elytral punctation, and both have the elytra widest near the basal angle. There is one other closely related genus, also confined to the West Indies, *Elytrogona,* of which *decemmaculata* is suggestive in the pattern of its elytral spotting and coarse punctation, although it is not nearly so coarsely punctate as the species of *Elytrogona.* No spotted species of *Stoiba* has previously been described. One is struck by the apparent intergradation between these two genera as illustrated by *decemmaculata* and the following species, *Elytrogona gemmata.*

This species has been doubtfully determined in the collection of the American Museum of Natural History as *Elytrogona bulla* Boh., but it can not very well be that since that species is described as being red, with the elytra most coarsely punctate ("cribrose"), and the elytral spots are differently placed from those of *decemmaculata.*

Elytrogona gemmata new species. Fig. 10.

> Red with pale yellow antennae, elytra with eight black spots, somewhat shining; prothorax and elytra widely margined, elytra coarsely punctate, very convex, and with apices produced. Head not visible from above, red with darker mouthparts; a median line down vertex; surface alutaceous with a few punctures. Antennae not longer than prothorax, first five basal joints slender, subglabrous, first and third joints longest, fourth and fifth subequal, the following joints somewhat thickened but all longer than broad and pubescent. Prothorax barely twice as broad as long at its widest point, the middle; the anterior margin not at all emarginate, but

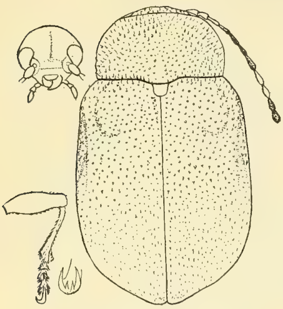
straight over the head, the sides explanate and broadly arcuate, constricted at the base in a sharp basal angle, basal margin lightly sinuate; disk with fine median line; surface alutaceous, indistinctly punctulate. Scutellum very inconspicuous. Elytra strongly convex, with broad explanate margin widest before middle and tapering to apex, apices produced; surface shining with extremely coarse punctures as in other species of *Elytrogona;* each elytron with four large black spots, two placed near suture on arch of elytron and two lateral, the one near the middle anteriorly extending onto explanate margin. Wings vestigial? Body beneath entirely red. Claws with broad blunt basal tooth.

Length, 8.5 mm.; width, 7 mm.

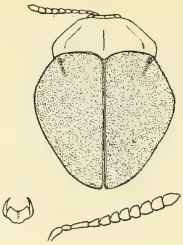
Type (♂).—Cat. No. 43119, U. S. N. M.

Type-locality.—Haiti, collected by Emery C. Leonard in 1920.

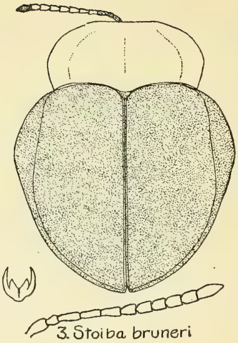
This species, like *Stoiba decemmaculata,* presents an interesting intergradation between the genera *Stoiba* and *Elytrogona,* but in its bright red coloring, elytral spotting and very coarse punctation it bears a closer relationship to *Elytrogona.* It resembles *Stoiba* more in the shape of the prothorax and wider elytral wing. The shape of the last six antennal joints is not like that of the other species of *Elytrogona,* the joints being longer and more cylindrical. Although in his description of *Elytrogona* Boheman distinctly states that the elytral apices are not produced, there is a strong indication of it in some specimens of *E. quatuordecimmaculata* Latr. and *E. bacca* Boh. (? the males), and in the one specimen of *gemmata* known this character is developed to a marked degree. Possibly the female has less produced apices. The expansion of the lateral margin in the elytra is also much greater in the present species as contrasted with other species of *Elytrogona.* Except for one which is reported from Cuba, all the species of *Elytrogona* have thus far been taken only in Haiti.



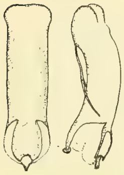
1. Chalcosicya maestrensis



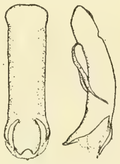
2. Stoiba indivisa



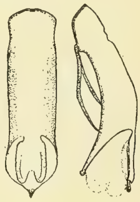
3. Stoiba bruneri



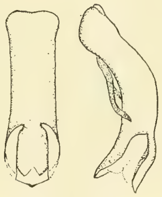
4. Disonycha coniugata



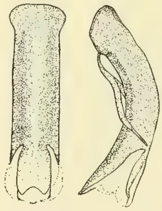
5. D. pensylvanica



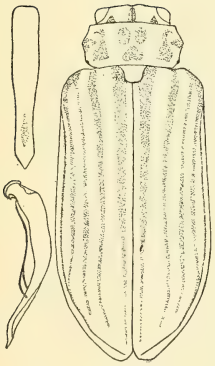
6. D. pallipes



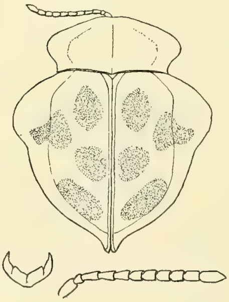
7. D. uniguttata



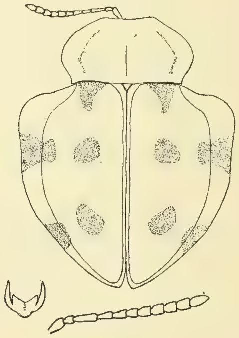
8. D. limbicollis



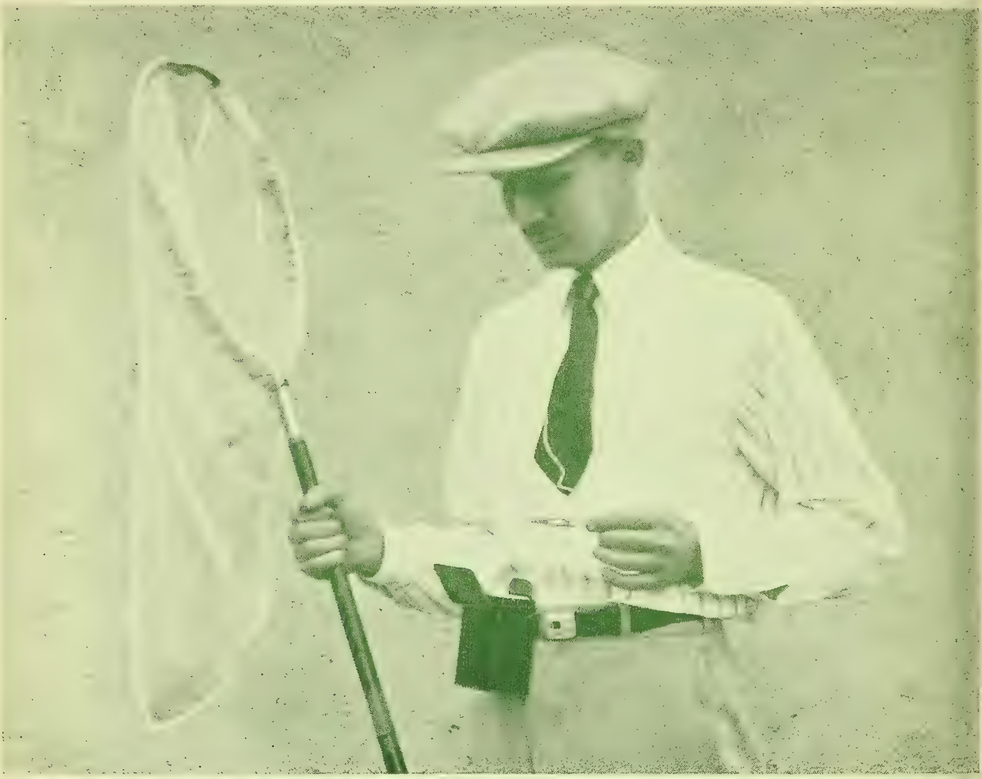
9. Galerucella maculipes

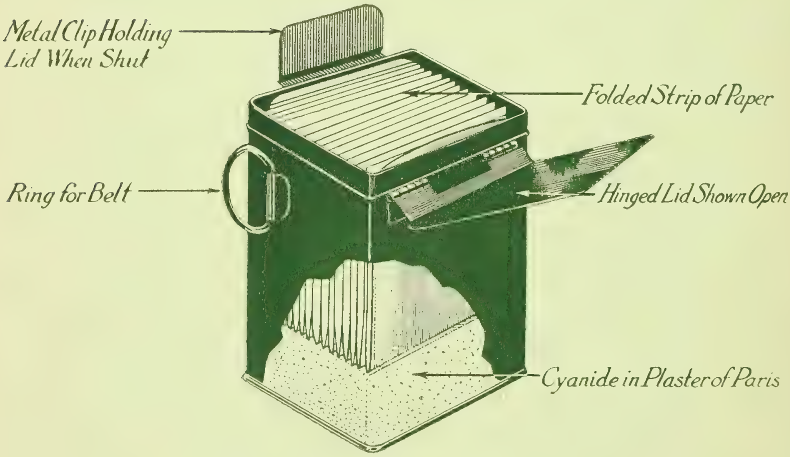


10. Elytrogona gemmata



11. Stoiba decemmaculata




Metal Clip Holding Lid When Shut
Folded Strip of Paper
Ring for Belt
Hinged Lid Shown Open
Cyanide in Plaster of Paris

A Convenient Collecting Container for Butterflies—Gunder

A CONVENIENT COLLECTING CONTAINER FOR BUTTERFLIES.

By J. D. Gunder, Pasadena, California.

Various ways are in vogue for handling and caring for freshly caught butterflies while in the field. Some collecters use pretty clumsy methods, such as stuffing extra cyanide bottles full or patiently laying each catch in little pill boxes after killing or tediously pinning every newly caught individual in a voluminous container which is difficult to keep in contact with if there is fast netting over a wide area. Probably the prevalent fashion throughout Eastern United States at the present time is to carry one pocket full of empty envelopes and have the other ready to cram full of filled ones. All these methods seem to me to be rather hard on the collector and equally hard on his specimens, in addition to taking up much time which could otherwise be employed in search, etc. So, it is the object of this paper to explain a simple, inexpensive and very satisfactory scheme which has been in use for sometime on the Pacific Coast.

About ten years ago Mr. Hal Newcomb, of Los Angeles, conceived the idea of hanging an empty Baker's Cocoa tin on his belt as a receptacle for butterfly specimens while collecting. The bottom of the tin was filled with cyanide (see illustration) and the rest with one, long, narrow, folded-back-and-forth, strip of paper. The secret of success lay in the fact that the folds kept the newly caught specimens in perfect shape (wings folded correctly), while they were being killed by the fumes and also afterwards. As many as 100 specimens could be kept in the tin and put in one at a time and there was never any rubbing; in other words, a day's catch in the field could be kept this way and later sorted out upon returning home. The lid of the tin, being hinged on the outer side, allowed the container to be opened and closed at will with one hand which added to its convenience and also kept the cyanide weak enough to prevent discoloration of specimens. To save rusting the outside of the tin was painted black. A pair of Denton forceps hung on a string around the neck was found to be a necessary adjunct to this method of collecting. Being hung there, they could not get lost and were in immediate reach to transfer the living butterflies directly from the net to the tin. This little tin box hung on your belt is a splendid idea and will keep your specimens in good shape until papered or mounted.

POSTSCRIPT TO "STYLOPIZED VESPIDAE," IN PSYCHE, VOL. 36, 1929, PP. 249–282.

By George Salt, Farnham Royal, Bucks., England,
and Joseph Bequaert, Boston Mass.

A note in the April, 1930, issue of this Bulletin, entitled "Position of Strepsiptera on hosts," tends to convey the idea that, in the preparation of our joint paper on "Stylopized Vespidae," we overlooked some important data. The following remarks will show how far this criticism is justified.

1. Our list of "References" was not intended to be a "bibliography" of the subject. It lacks many other papers besides the one selected by our critic. These papers, in so far as they contain records of stylopized wasps, are quoted directly in the text by the abbreviated title of the periodical. The "References" are only to papers so often quoted as to make worth while some shorter method of citation.

2. The statement: "In 4 all account of 2 is avoided and it is excluded from the References, but mention is made of *Odynerus piziæ* mss.," is partly answered by the foregoing paragraph. Moreover, so far as we could see, all the species of Vespidae listed in our critic's "2" (except *Leionotus ziziæ*) were included in his earlier "1," from which we had faithfully quoted them in our account.

3. In the absence of any explanatory remark, we believed that our critic's record of *"Leionotus ziziæ"* was based upon a specimen not mentioned previously by him. We are now (1930) told for the first time that "This is the same insect as *Leionotus pedestris* listed in "1." However grateful we must feel for this bit of information, we regret to say that it is sadly inadequate. Must we conclude that *"Leionotus ziziæ"* is a synonym pure and simple of *Odynerus pedestris* H. de Saussure, or does the author regard it as a distinct species? In the latter case a description would be welcome or at least some indication of how *"ziziæ"* is to be told apart from *pedestris* and the other related species of this difficult group of *Odynerus*. Meanwhile, *ziziæ*, if not a synonym, is a manuscript name, without standing in nomenclature.

4. On p. 274 of our paper we wrote: "In these and the following figures we have not thought it necessary to incorporate the

data so admirably summarized by Pierce, and have confined ourselves to those in the above list." It would seem that this statement would preclude any claim to "priority" on our part with regard to the several topics of general interest discussed at the end of our article. At this late date, when so much has been written on every conceivable subject, it is always a ticklish business to claim "priority." Thus our critic was by no means "the first" to study the "position of Strepsiptera on hosts." In his classic paper on the effects of stylopization (1886), J. Pérez devoted several paragraphs to this topic. We beg leave to quote two passages only: "C'est d'ordinaire entre le quatrième et le cinquième segment de l'abdomen de l'Andrène, qu'est fixé le Stylops, c'est-à-dire sous le bord du quatrième, que l'on voit saillir la tête de ce dernier. Là est son lieu d'élection. Le parasite se voit quelquefois aussi sous le bord du troisième segment, moins souvent sous le cinquième. Mais ce sont là des cas fort rares, car je ne les ai pas observés plus de deux ou trois fois sur cent." And later he noted: " Chez les Vespides, le nombre des Xénos que peut porter le même hôte est plus considérable, et leur distribution sur l'abdomen de la guêpe est loin de présenter la régularité qui se voit chez les Andrènes."

Moreover, as early as 1842 (Stettiner Ent. Zeitg., III, pp. 53–57), Rosenhauer published a table essentially similar to that of our critic. He tabulated 77 stylopized *Polistes gallicus,* caught near Erlangen, Germany, and showed conclusively that the male parasites usually lie before, under the third or fourth segments (of 82 males, 1 was under 2, 17 were under 3, 57 under 4, and 7 under 5), and the females usually lie behind, under the fourth or fifth (of 38 females, 1 was under 3, 14 were under 4, and 23 under 5). Our critic's observations on *Polistes* were therefore no more "new" than our own. The senior author's observation, published in 1927, that in *Odynerus* the female parasites lie before and the males lie behind, the opposite to the condition in *Polistes,* was not previously published by our critic. He merely showed that "in 30 cases parasites of *Odynerus* fell into two sets, 14 under 3, and 10 under 4;" but he did not say anything about the sex of the parasites or what he meant by "set." Nor did he contrast the condition in *Odynerus* with that in *Polistes.*

5. The origin of our material was clearly stated in the introduction to our paper as well as in the text. Every specimen, however, listed under "New records," regardless of whether or not it

bore a species label, was identified by one of us (J. B.), and he assumes full responsibility for the names. That in the four cases mentioned by our critic, our identifications agree with his is not surprising, since these species are readily recognizable. The fact should please, rather than disturb him. How the label of "*L. foraminatus*" became detached is a deep mystery, but we may assure our critic that it was not "removed by Salt" for some dark motive. More likely, the other member of our partnership was at least an accessory to the crime.

EDITORIAL.

WHAT IS A SPECIES?

The question of biological categories lower than species is always with students of living forms; and particularly presses upon entomologists. Now, it might seem as though any form sufficiently distinct structurally from others allied thereto, should automatically be regarded as a species. What the ultimate definitive structures to be considered are, is in many instances a pure matter of opinion, of which opinions the best, because the more carefully reasoned, is that of a monographer. With the discrimination born of intensive study and evaluation of morphological and taxonomic characteristics of all sorts, such a monographer is the one best fitted to have a valid opinion on what constitutes a species in the group so monographed, and on what may be regarded as incipient or nascent species, or, at least, stable differentiated categories, sufficiently distinct among themselves but agreeing in possessing the critical characters of the valid species.

Predicating these conditions, it may reasonably be deduced that the publication of marooned two- or three-line characterizations of subsp., vars., abs., forms, races, etc., is scarcely convincing in the absence of a general discussion of the relationship and factors of the category, which ought to be fully described.

Now, what is an incipient species? Undeniably, not a sport of the moment, which is seen once and never again. If a species has a certain variability or instability and gives rise to variations from the norm in sufficient numbers and with sufficient differences, we may reasonably conclude that such a species is in a condition of flux. We may also conclude that any one (or all) of these differentiations is potent to perpetuate itself, if the evolutionary factors operating to cause the sport to appear should be stabilized, continuous and active; or if the change is of biological value to the new form of the old species.

The basic question, however, is, "What is a species?" Is it a stable biological unit? Or is it a group of forms about a norm? And further, can we consider a species to be a fixed and unchangeable entity, or is it but a distinct, recognizable and describable static moment in the ceaseless flow of life?

In a proper and adequate discussion of all these factors, the description and discussion of such sub-specific categories is not alone logical, but it is likewise imperative.

But the description of isolated minor forms from unique specimens does not present itself as being logical; and, far less, as imperative.—J. R. T.-B.

Entomologica Americana.

Subscribers to our monographic journal are well aware that, of late, its appearance has been irregular and is now much delayed. We believe they should know why this is so.

As originally planned, ENTOMOLOGICA AMERICANA was designed to carry papers between 40 and 80 pages in length—that is, those papers too long for the regular journals and too short for individual publication. Our difficulty has been, and is, to secure such papers. They are being written, but we do not get them—neither, seemingly, does any other publication.

We have had at times under consideration lengthy and heavily illustrated works of importance, but unfortunately, our small income from this publication has put the expense of publishing them out of the question.

It has been and is our purpose to make this publication self-supporting. Our Society has neither income-producing endowment nor legacies with which to finance its publications. It depends entirely on the support of its subscribers. If this be lacking, then no amount of good-will on our part will enable us to meet expenses, for which cash is the indispensable requisite.

Neither can we publish with any degree of regularity unless we have the material.

We hope that our Bulletin readers will give serious attention to this matter, because without adequate cooperation it is not possible to achieve.—J. R. T.-B.

Change of Address.—The attention of our readers, particularly of our Society members and subscribers, is directed to the *permanent* new address of our Treasurer, Mr. Geo. P. Engelhardt. This is **28 Clubway, Hartsdale, N. Y.**

BOOK NOTES.

A Manual for the Study of Insects—Revised Edition—by John Henry Comstock and Anna Botsford Comstock and Glenn W. Herrick. 19th Edition, pp. i–xiii–1–401, plates I–III, figs. 1–633. (Comstock Publishing Co., 1930. $4.00.)

The appearance of the standard American Manual is always an event in our entomological history. In this instance, the Manual has been brought down to date and in accord with the latest advances in entomology by Dr. Herrick, one of Dr. Comstock's old-time students and now one of his colleagues at Cornell. No more need be said to establish its authoritative characters.

No better note on this book can be found than these words from the Introduction to this new edition: "The aim of this revision has been to keep the Manual in form and arrangement practically as it was first written. The attempt has been made to bring the subject-matter down to date, to simplify it and to condense it somewhat in order to bring it within the horizon of the beginning student."

Studies in the Insect Fauna of Iowa Prairies, by George O. Hendrickson. Iowa State Journal of Science, vol. iv, no. 2, pp. 49–179. 1930.

This interesting essay is well-worth careful reading. It is an intensive study in insect ecology, which should help entomologists in the study of insect and plant associations, especially those entomologists making their debut in the science. Naturally, this work is rich in date of occurrence and food plants of the species collected.

Necessarily, some of the occurrences noted are quite adventitious, as where normally tree-inhabiting species, such as *Chlorochroa uhleri* or *Banasa dimidiata* is swept from grasses. The bulk of the other Heteroptera taken are such species as are normally found in grasses.

In general, as regards the Heteroptera, this study points to the use of the sweeping net in grasses as the best means to secure extensive collections of representative species fast and in abundance. No less than 121 species were taken in the course of this study. Of these, at least 42 are characteristic grass species.—J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF FEBRUARY 13, 1930.

A regular meeting of the Brooklyn Entomological Society held at the Brooklyn Museum, Eastern Parkway, Brooklyn, N. Y., on Thursday evening, February 13, 1930, at 8.22 p. m.

President Davis in the Chair and 14 members present, viz.: Messrs. Bell, Black, Burke, Chapin, Cooper, Lemmer, Lersch, Notman, Rau, Schaeffer, Sheridan, Siepmann, Torre-Bueno and Wilford.

Minutes of the previous meeting read and approved.

In the absence of Mr. Engelhardt, the report of the Treasurer was presented by Mr. Torre-Bueno.

Mr. Torre-Bueno reported for the Publication Committee, that the annual report was deferred until next meeting on account of the lack of complete data.

The Secretary read reprints from the *Daily Argosy*, a Guiana publication, under dates of December 31, 1929, and January 1, 1930, concerning the expedition of Pinney Schiffer, one of the members of the Society, to French Guiana; the Secretary also read a letter from Mr. Raymond H. Torrey with reference to joint field excursions of the Torrey Botanical Club and the Brooklyn Entomological Society; on motion duly seconded, Mr. Sheridan was appointed the representative of the Society to confer with Mr. Torrey and make whatever arrangements are necessary in this respect.

Mr. Davis read a card from Mr. Engelhardt, sent from California on the eve of his departure for Central America, on the expedition to explore Mayan ruins.

Mr. Lemmer exhibited a branch of pitch-pine from Lakehurst, N. J., showing the workings of *Callidium antennatum* Newn., a Cerambycid beetle.

Mr. Torre-Bueno presented his paper "Heteroptera Collected by George P. Engelhardt on His Western Trips," published in full in the Bulletin. Mr. Torre-Bueno's paper was discussed by the members.

Mr. Schaeffer exhibited and remarked on specimens of *Calligrapha lunata* Fabricius, a Chrysomelid beetle, and the forms *hybrida* Say, *latevittata* Ach., *bowditchi* Ach., *medisrupta* Ach., these being arranged to show the variation from typical *lunata* in more extensive or reduced maculation and color.

Mr. Davis exhibited and remarked on specimens of the Japanese beetle from Staten Island, and will publish his notes.

Adjourned 9.30 p. m.

E. L. Bell,
Secretary.

Meeting of March 13, 1930.

A regular meeting of the Brooklyn Entomological Society was held in the Brooklyn Museum, on Thursday evening, March 13, 1930, at 8.22 p. m.

President Davis in the Chair, and twelve members present, viz.; Messrs. Bell, Bowdoin, Burke, Cooper, Lemmer, Lersch, Mann, Rau, Schaeffer, Sheridan, Siepmann, and Torre-Bueno.

Minutes of the previous meeting read and approved.

Mr. Torre-Bueno reported for the Publication Committee that the Annual Report was postponed until the April meeting on account of the complete data not being at hand.

Mr. Torre-Bueno presented the Report of the Treasurer, in the absence of Mr. Engelhardt.

Mr. Cooper proposed for membership Mr. Lawrence Bowdoin, of 149–31 19th Avenue, Whitestone, N. Y.

It was reguarly moved and seconded, and passed, that the bylaws be suspended and that Mr. Bowdoin be elected a member of the Society.

The Secretary read letters from Dr. Rimsky Korsakow, Dr. Karl Jordan, Dr. Walther Horn and Dr. E. L. Bouvier expressing their appreciation on being elected Honorary Members of the Society.

Mr. William T. Davis showed the walking-stick insect *Manomera atlantica* Davis collected at Greenport, Long Island, N. Y., September 11, 1929, and Sag Harbor, Long Island, September 21, 1929, by Mr. Roy Latham; also a map of Long Island in which eleven other localities were marked where the insect has been found. It is well distributed over the Island from Brooklyn to the eastern part, and so far only females have been discovered.

Mr. Davis also showed the book "The Gall Wasp Genus Cynips, a Study in the Origin of Species," by Alfred C. Kinsey, Professor of Zoology, Indiana University; and also a box containing specimens of the galls of *Cynips centricola* Osten-Sacken, which he had collected at Farmingdale, Long Island, N. Y., on post-oak, the record of which was in Prof. Kinsey's book. Mr. Davis also exhibited galls of *Amphibolips inanis* Osten-Sacken, a smaller gall but of similar appearance to the one mentioned. Mr. Davis's remarks were discussed by the members.

Mr. Davis showed a circular by Henry Fox, published by the Dept. of Agriculture of the State of New Jersey, on " A Revised Annotated List of the Dermaptera and Orthoptera of New Jersey," in connection with the walking-stick insect.

Mr. Torre-Bueno presented his paper on " Life History of Trepobates," which will be published.

Mr. Lemmer exhibited a box containing a series of twenty specimens of the moth *Anticarsia gemmatilis* Hübner, collected by him at Lakehurst, N. J., in October, 1929, and which showed a wide range of variation in maculation.

Adjourned, 9.25 p. m.

E. L. Bell,
Secretary.

Meeting of April 10, 1930.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, April 10, 1930, at 8.10 p. m.

President Davis in the chair and nine members present, *viz.*, Messrs. Ballou, Black, Cooper, Lemmer, Lersch, Schaeffer, Shoemaker, Siepmann, Torre-Bueno, and Wilford, and three visitors.

In the absence of the secretary, Mr. Siepmann acted as secretary pro tem.

The minutes of the previous meeting were read and approved. Mr. Torre-Bueno reported for the treasurer and for the publication committee.

Mr. Davis read a letter from Mr. Bell, reporting the death on Tuesday, April 1, of Mr. Frank Haimbach, who was connected with the staff of the Academy of Natural Sciences in Philadelphia.

Mr. Torre-Bueno proposed for membership Dr. J. D. Hood, whose election was referred to the next meeting.

Mr. Davis read a communication from Mr. D. K. Duncan, of Globe, Arizona, who is interested in selling or exchanging Arizona Coleoptera.

Mr. Wurster exhibited a melanic specimen of the moth *Telea polyphemus.*

Mr. Cooper exhibited specimens of *Baeocera picea* Csy. and *Scaphisoma repanda* Csy. obtained by sifting at Flushing, L. I. Both species are new to New York.

Mr. Lemmer exhibited specimens of the following new Lepidoptera collected by him at Lakehurst, N. J.:

Eriopyga lindseyi Benjamin.
Graptolitha lemmeri Barnes & Benjamin.
Chytonix sensilis form *macdonaldi* Benjamin.
Catocala gracilis form *cinerea* Mayfield.
Catocala gracilis form *lemmeri* Mayfield.
Catocala sordida form *metalomus* Mayfield.
Zanclognotha martha Barnes.
Olene aridensis Benjamin.
Olene lemmeri Barnes & Benjamin.
Paraphia esther Barnes.
Paraphia esther form *lemmeri* Barnes.

Mr. Schaeffer presented a paper on the North American species of *Calligrapha,* of which he exhibited specimens. He stated that the genus has not yet been properly studied, and that the earlier authors, as Crotch and G. W. J. Angell underestimated the number of species, the latter figuring *scalaris, philadelphica, amelia,* and *rowena* all as varieties of the same species. Judging by the color pattern alone, one would suppose them to be mere color varieties, but there are also differences in size, form, and structure, which are constant with each species.

Mr. Torre-Bueno commented on the damage done to wild life of all kinds by forest and field fires, and by unthinking people whose chief interest in nature is to kill the birds, tear up the flowers, and in general destroy and disfigure every object of nature. His discussion was continued by the other members.

Adjourned at 10.10 p. m.

CARL GEO. SIEPMANN,
Secretary pro tem.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

PHOTOGRAPHS WANTED.—Entomologists, Naturalists, and other Scientists are cordially invited to send us their photographs for publication purposes. Pinney Science Photos, 20 Girst Avenue, New York, N. Y.

WE WISH to procure in exchange or on cash: *Parnassius of North-America,* with its varieties and aberrations, well labelled, spread or in papers (clodius, smitheus, eversmanni). Dr. Staudinger & A. Bang-Haas, Dresden-Blasewitz.

THE MUSEUM of the Brooklyn Institute has a few uncolored sets of the Calverly, Weidenmeyer and Edwards plates of North American Sphingidae for exchange or for sale at $5 per set. Address, Librarian, Brooklyn Museum, Eastern Parkway, Brooklyn, N. Y.

LEPIDOPTERA from the Mountains of Kentucky. Papilios and other var. of this section collected. Paper spec. of *Xylophanes tersa* and *Catopsilia eubule* on hand. Also Cocoons of the larger Saturnid moths. Ellis Chandlee, Barbourville, Ky.

BUTTERFLY COLLECTORS—Have you butterflies which look different in color or pattern from the average? (See advertisement). Please write. Jeane Gunder, Pasadena, Calif.

CHRYSOMELIDAE, CRYPTOCEPHALINI. Wish beetles of this group from all over world. Will exchange local Coleoptera or purchase for cash. Write me before shipping material. Paul N. Musgrave, 514 Mt. Vernon Ave., Fairmont, W. Va.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

Vol. XXV DECEMBER, 1930 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

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JAN 15 1931
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J. R. de la TORRE-BUENO, Editor
E. L. BELL GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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J. R. de la TORRE–BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXV December, 1930 No. 5

A COMPARISON OF THE MORE IMPORTANT STRUCTURAL DETAILS OF THE LARVA OF THE ARCHAIC TANYDERID DIPTERON PROTOPLASA FITCHII WITH OTHER HOLOMETABOLA FROM THE STANDPOINT OF PHYLOGENY.

By G. C. Crampton, Ph.D., Massachusetts Agricultural College, Amherst, Mass.

In Vol. 55, p. 221, of the Proceedings of the Linnean Society of New South Wales, for 1930, Dr. C. P. Alexander has given an excellent general account of the immature stages of the Tanyderid Dipteron *Protoplasa fitchii* O. S., and to his general description of the larva, I would add the following details from a *Protoplasa* larva captured by me during an expedition to the Gaspé Peninsula, Quebec, undertaken by Dr. Alexander and myself, in the hope of obtaining the hitherto unknown immature stages of the Tanyderidae in the region where I had formerly encountered swarms of the rare and primitive *Protoplasa* (Can. Ent., 1929, Vol. 61, p. 70).

We had expected that the larva of *Protoplasa* would be an extraordinary looking creature like the supposed larva of this insect figured in Dr. Alexander's "Craneflies of New York"; but when we finally found the larvae of *Protoplasa* on June 19, 1929, in the shallow waters of the west branch of the Pabos River, two or three miles west of the town of Chandler, Quebec, they turned out to be very *Chironomus*-like, small, slender creatures, about 17 mm. long and 1.5 mm. broad, eucephalous, with brown heads and pale bodies, amphipneustic (but with the posterior spiracles on the *sides* of the eighth abdominal segment), with a pair of posterior "pseudopods," and with slender posterior gills instead of an anal breathing tube (like that of the supposed larva of *Protoplasa*).

The larvae were found in the sand and gravel of the shallower waters (a few inches deep) a couple of feet from the shores of the west bank of the Pabos River, a few yards above the old wooden bridge over the West Pabos River, which is about 120 feet wide at this point. The stream was very sluggish, and workmen who were repairing the old wooden bridge which had been broken by the weight of a heavy automobile, informed us that the water of the river was affected by the tides of the Bay of Chaleur, a few miles away, but the river water was perfectly fresh to the taste, and I could detect no difference in the level of the water of the river during the hours we spent in searching for the larvae of *Protoplasa.*

The *Protoplasa* larvae were so extremely small and difficult to detect, that as soon as I had captured one specimen for study, after hours of back-breaking work under a broiling sun, and amid swarms of pestilential " black flies " and " punkies " which gave us no peace, I gave up the discouraging search for more specimens; but Dr. Alexander persisted in the search until he had obtained about eight larvae, two of which were allowed to pupate (see description of the pupae by Alexander, 1930, l. c., with added details given by me in Vol. 32, p. 83, of the Proceedings of the Entomological Society of Washington for 1930). Before distributing his material to various museums, etc., Dr. Alexander gave me two more larvae for comparison with my specimen, and very kindly allowed me to make the sketches of a very large and well sclerotized larva from which Figures 6, 13 and 21 were made, before this specimen was sent away. Unfortunately, all of the specimens in my possession have the body so bent that the under surface of the head capsule is not visible for study, and since I do not wish to injure the valuable specimens by dissecting them at this time, I shall confine my remarks to such of the structural details as were visible in the larva from which the sketches were made.

In its general features, the type of head-capsule exhibited by *Protoplasa* (see Fig. 13) is the most primitive one that I have been able to find among the larvae of the Diptera, although in some respects the head of a larval Bibionid (see Fig. 31) is extremely primitive also, and in such features as the occurrence of peripneustic spiracles, etc., a Bibionid larva is even more primitive than an amphipneustic *Protoplasa* larva. The Bibionid larva, however (Fig. 31), has reduced antennae (like those of some Trichopterous larvae) a short coronal suture and other features indicating a greater degree of specialization than the larval *Protoplasa* exhibits in its head structures, and there is no doubt that *Protoplasa* is very much more primitive than any Bibionid; but none the less, a larval Bibionid is of great interest in attempting to determine the character of the primitive Dipterous head, and cannot be ignored in such a study.

When the larvae of the Dipteron-like Mecopteron *Nannochorista* are discovered, they will doubtless be extremely similar to the larva of *Protoplasa,* particularly in the head region, but until these larvae have been found, we must do the best we can with the Mecopterous larvae available for study. Of these, the larva of the Mecopteron *Panorpa* shown in Fig. 30 furnishes the best prototype from which the *dorsal* structures of the larval head-capsule of primitive Diptera could be derived, while the larva of the Mecopteron *Boreus* shown in Fig. 32, will serve somewhat better for deriving the *ventral* structures of the head capsule of the primitive Diptera. A study of the mouthparts of larval Trichoptera is likewise very instructive in this connection, while features encountered in the head capsule of larval Lepidoptera and Neuroptera are also of value (particularly in the arrangement of the setae, etc.). The head-structures of larval Mecoptera and Trichoptera are so suggestive of the prototypes of the Dipterous structures that we must assume that the common ancestors of the Mecoptera and Trichoptera were the forms from which the Diptera were derived, instead of assuming that the Mecoptera alone are the nearest representatives of the ancestors of the Diptera.

Within the order Diptera, the larvae of the Chironomidae are as much like the larvae of *Protoplasa* as any I have seen, in the general appearance of the body, with its pair of posterior "pseudopods," etc., and this might be interpreted as lending some support to the views of Lameere, who grouped together the Culicoids (including the Chironomids) and Psychodoids (which include the Tanyderids), or the view of Edwards who maintains that the Psychodoids (including the Tanyderids) gave rise to the Culicoids (including the Chironomids); but the details of the head structures, etc., of the larva of *Protoplasa* are not sufficiently similar to those of a Chironomid larva to demonstrate this satisfactorily. On the other hand, the larval structures do not seem to lend much support to the evidence of rather close relationship between the Ptychopteridae, Tanyderidae and Psychodidae (with *Nemopalpus* and *Bruchomyia*) indicated by the thoracic sclerites (see Vol. 37, p. 33, of the Entomological News for 1926), nor do the larvae lend much support to the view of Edwards that the Blepharocerids were descended from Tanyderid forebears (see also thoracic resemblances between the adults mentioned on p. 63 of Vol. 19 of the Annals of the Entomological Society of America for 1925), and it is a question as to which stages we shall consider the most important, in grouping insects according to their larval, pupal or adult characters.

While I would emphasize the fact that no source of information should be ignored in attempting to arrange the orders and families, etc., of insects according to their natural affinities (i. e., phylogenetically or genealogically) I am inclined to give greater weight to the evidence of relationship furnished by the structures of the adult insects in such a study, for the following reasons. The larval stages are usually very plastic and are evidently profoundly modified in adaptation to their own individual (specific) environmental conditions, becoming in this process extremely modified away from the main evolutionary trends which are followed more conservatively by the adults. In other words, the larvae present many "sidewise" developments or caenogenic modifications having no real evolutionary significance and frequently representing individual (specific) adaptations each to its own peculiar environmental conditions. They thus frequently present broken series of isolated types not intergrading through closely connected intermediates as is more frequently the case when the adults are studied, and because of this fact, the evidence of the adult structures is much more satisfactory for arranging the groups according to their natural affinities. I realize that in some cases, such as the classification of Culicids on the basis of larval structures, the study of the larvae pointed the way for a better arrangement of the groups than had been employed in arranging them according to the trivial characters used in the classification based upon the adults alone. In this case, however, the details of structure had been better studied in the larvae, while the structures of the adults were practically unknown to the students of the group who fastened their attention upon such trivial characters as the hairs and setae and what not, to the neglect of the really fundamental features, upon which any real knowledge of relationships is based. In fact it is usually the case that a student of one group of insects does not know the entire anatomy (external) of any insect in that group and knows but little of the comparative anatomy of the general features of the adults, with the result that he frequently does not know what is fundamental or really important in contrast to the trivial features having but little significance for indicating true relationships. On the other hand, some of the accepted views regarding the arrangement of the families, orders, etc., are quite superficial or erroneous, and there is a great need of a thorough study of the comparative anatomy of adult insects as well as the comparative anatomy of the immature forms to serve as a check on the findings based upon the study of adults alone.

A phylogenetic or genealogical study of insects should not be limited to the study of the relationships of the families within an order of insects, but should be of such a character that it can likewise be applied to the grouping of the orders themselves according to their natural affinities, and the same kind of evidence should be used in both cases, the evidence for the grouping of the orders being merely more comprehensive or inclusive, instead of being of a wholly different character from that used in grouping the families. When we adopt this broader viewpoint in grouping insects in the general scheme, it at once becomes apparent that the larval characters are of much less value than the adult ones. Thus, for example, we are unable to compare the larvae of even the lowest Holometabola (which are still very different from the corresponding adults) with the immature stages of the Psocoid and Orthopteroid forms (which were like the forebears of the Holometabola) since the immature stages of the Orthopteroids, etc., are essentially like the adults; and it is therefore necessary to compare the adult Holometabola with the mature Orthopteroids in order to get the intermediate stages indicating the paths of development followed in deriving the Holometabola from their Orthopteroid precursors. Thus when we work up from a comparison of the orders of Orthopteroid insects to a comparison of the orders of Holometabolous insects and from this to a comparison of the families within these orders (using the same kind of evidence) it is impractical to use larval characters, and the real importance of the adult characters is impressed upon the student having the wider viewpoint (and supposedly with a better background to enable him to determine what is really primitive or fundamental when he attempts to apply his knowledge to the smaller groups also).

While giving greater weight to the adult characters, it would be folly to ignore the evidence of relationship available from any other source (even palaeontology, embryology, ecology and behavior, etc., should be called upon for testing the views based upon the study of one type of evidence) but when the structures of the larvae confirm the evidence of relationship indicated by the structures of the adult insects we should feel that the views based upon this wider study are more sound. On the other hand when the larval structures offer no definite evidence of relationship, it is preferable to depend upon that furnished by the adult structures. The larva of *Protoplasa* is of such an isolated type that until we know more about the larvae of such forms as the primitive Psychodoids (e. g., *Nemopalpus* or *Bruchomyia*, etc.) we cannot definitely determine the closest relatives of the Tanyderids from the larval characters as well as we can from the adult features, such as the venation, etc., and in the present state of our knowledge it is not possible to do more than to indicate wherein the larval structures of *Protoplasa* confirm the evidence of relationship indicated by the structures of the adults.

Taking the dorsal view of the head of the larva of *Panorpa* shown in Fig. 30 as the prototype from which the larval head capsule of the Diptera was derived, we note that the coronal suture *c* is proportionately quite long (i. e., the stem of the Y-shaped epicranial suture is well developed), and the fact that the coronal suture *c* of *Protoplasa* (Fig. 13) is longer than that of the Bibionid larva shown in Fig. 31 indicates that the head capsule of the *Protoplasa* larva is more primitive in this respect. On the other hand, the frontal sutures *fs* of the Bibionid larva (Fig. 31) are more specialized in being much longer proportionately than the frontal sutures of *Protoplasa* (Fig. 13, *fs*) and those of the larva of *Panorpa* (Fig. 30, *fs*). In the Culicid larva shown in Fig. 33, the frontal sutures *fs* are greatly developed, and this likewise may be taken as a specialized feature, although the eyes *e* of the Culicid larva are compound, like those of *Panorpa* (Fig. 30, *e*) and are therefore more primitive than are the eye spots *e* of *Protoplasa* (Fig. 13).

The antennae *a* of *Protoplasa* (Fig. 13) are three-segmented and the proportions of the component segments are strikingly like those of the three-segmented antennae *a* of *Panorpa* (Fig. 30), and in this respect, the antennae of *Protoplasa* (Fig. 13) are much more primitive than those of the Culicid shown in Fig. 33, despite the fact that the antennae of this Culicid larva are very well developed. For some unknown reason, the antennae *a* of the Bibionid larva shown in Fig. 31 are reduced to the merest rudiments (as in some Trichopterous larvae) despite the fact that the head capsule of the Bibionid larva is quite primitive, and its mouthparts are very primitive for those of a Dipterous larva; but this feature of heterospecialization, or unequal specialization in different features of the body, is a very common phenomenon among insects, and in reconstructing the archetype or original condition of any body part, we have to combine the primitive features retained by several different insects instead of depending upon any one insect to present all of the primitive features in a condition approaching the original one.

The character of the labrum, *lr,* anteclypeus, *ac,* and postclypeus, *poc,* in the larva of *Panorpa* shown in Fig. 30 may be taken as representing the original condition from which these sclerites were derived in the Diptera, and in these features the Bibionid larva shown in Fig. 31 and Fig. 12 is fairly primitive, although the labrum *lr* is not clearly demarked in the Bibionid. The larva of *Protoplasa* shown in Figs. 8 and 13 is disappointingly specialized in this region of the head, since the labrum *lr* in more membranous than one would expect to be the case in such a primitive Dipteron. The epipharyngeal brushes or labrobrustia labelled *es* in Fig. 13, are borne on the epipharyngeal surface of the labrum and doubtless are used to brush the food into the mouth as the larva feeds. The posterior limits of the labrum in the *Protoplasa* larva are indicated by the tormae labelled *t* in Figs. 6 and 21 as in Orthopteroid insects, and there is also an " intertorma " or small median transverse sclerite resembling the " intertorma " described in *Stenopelmatus* (Pan-Pacific Entomologist, Vol. 6, p. 97, for 1930), since it lies just behind and between the tormae. The " clypeites " *cl* or sclerites in the anteclypeal region *ac* in the larva of *Protoplasa* (Fig. 8 and Fig. 13) are other Orthopteroid structures resembling those described in *Gryllotalpa* and *Cylindracheta* (Entomologische Mitteilungen, Vol. 17,

p. 252, for 1928) and I think that these " clypeites " form the anterior sclerites incorrectly called the " tormae " in the frontal views of the head capsule of adult Diptera by Peterson, 1916 (Illinois Biol. Monographs No. 2, Vol. 3, p. 177), because the tormae are always borne on the buccal surface (or "roof of the mouth"), while the " clypeites " are borne on the frontal surface of the head, and I think that this distinction is not a purely academic one, since the two types of structures are not actually homologous. The postclypeus *poc* in *Protoplasa* and the other larvae shown in Figs. 8, 13, 31, 30, etc., extends as far back as the imaginary line across from one frontal pit (or frontocava) *fp* to the other, and this postclypeus corresponds in a general way to the region called the epistoma in Coleopterous larvae, and may be used as a synonym for the latter term. Behind the postclypeus or epistoma *poc* of the larvae shown in Figs. 30, 31, 13, etc., is the frontal region *f*. Snodgrass, 1928 (Smithsonian Misc. Collections, Vol. 81, No. 3, p. 1) is inclined to use the muscle attachments for delimiting the posterior boundaries of the clypeus (or its posterior region the postclypeus), but I have followed Peterson, 1916 (l.c.), in using the frontal pits to demark the posterior limits of the clypeus, and have regarded the region behind the frontal pits *fp* (and bounded posteriorly by the frontal sutures *fs*) in Figs. 30, 31, 13, etc., as the frons. The curve in the frontal sutures *fs* near the frontal pits *fp* in the Bibionid and Tanyderid larvae shown in Figs. 31 and 13 is very like that of the frontal sutures *fs* in the larva of *Panorpa* shown in Fig. 30.

The nature of the thoracic sclerites of adult Ptychopteridae, Tanyderidae and Psychodidae (including *Nemopalpus* and *Bruchomyia*) indicates that these insects are quite closely related (see Ent. News for 1926, Vol. 37, p. 33); but the larvae that I have been able to examine do not bear out the relationship indicated by the adults, possibly due to the fact that such primitive Psychodids as *Nemopalpus* and *Bruchomyia* are known only from the adults, and if their larvae were found, they might furnish evidences of relationships not indicated by the specialized larvae I have seen. At any rate, the character of the anterior regions of the heads of the Psychodid and Ptychopterid larvae shown in Figs. 9 and 10 is no more suggestive of a Tanyderid larva (e.g., Figs. 8 and 13) than a Bibionid, for example (see Fig. 12), and until the more primitive larvae of these Diptera are found, we must depend largely upon the adult characters for determining the closest affinities of the Ptychopteridae, Tanyderidae and Psychodidae.

While the dorsal or frontal region of the head of a *Protoplasa* larva (Fig. 13) is more like that of a larval *Panorpa* (Fig. 30), the under or ventral surface of the head of *Protoplasa* (Fig. 6) with its peculiar labial plate *gm* and paragular sclerites *pg,* is more like the under side of the head of a larval *Boreus* (Fig. 32). On the other hand, the mandible of a larval *Protoplasa* (Fig. 3) with its mandibular brush *b,* and the mandible of the larval Bibionid shown in Fig. 5, with its mandibular brush *b,* are much more like the mandible of the Trichopterous larva shown in Fig. 7, with its mandibular brush *b* (see also certain Coleopterous larvae) than the mandibles of these Dipterous larvae resemble that of a *Panorpa* larva, for example (see Fig. 1). Why the mandibles of these primitive Dipterous larvae should resemble the mandibles of a Trichopteron rather than a Mecopteron is not clear (though if we had the larvae of the Dipteron-like Mecopteron *Nannochorista* its mandibles would doubtless be more like those of the Diptera in question).

As was mentioned above, the under side of the head of a *Protoplasa* larva (Fig. 6), with its broad labial sclerite *gm,* apparently homologous with the gular and submental regions (with the mentum also?) and its paragular sclerite *pg,* is more like the under side of the head of the larva of the Mecopteron *Boreus,* shown in Fig. 32 than it is like the head of the larval *Panorpa* shown in Fig. 19, because the larva of *Panorpa* has no demarked paragular sclerite and instead of having the typical labial plate *gm* of Fig. 6, the ventral halves of the head are approximated to form the suture *mg* (which was referred to as the " midgular suture " in the figure of a larval *Panorpa* shown in Fig. 19, Plate 3, of Vol. 14 of the Annals of the Entomological Society of America for 1921—but see discussion of this region in Vol. 20, p. 1 of the Journal of Entomology and Zoology, Claremont, Cal., for 1928, where the single median suture is interpreted as an epigular suture, since it is formed by the meeting of the lips of the folds lying upon the infolded gular region). The larva of the Psychodid shown in Fig. 23 has such a median gular suture, and is therefore not very like the larva of the Ptychopterid shown in Fig. 17, which is more like the Tanyderid larva (Fig. 6) in having a distinct basal labial sclerite. Some larval Leptocerid Trichoptera have a distinct basal labial sclerite, while other rather closely related larvae have an overgrowth of this region resulting in the formation of a single suture in this region (somewhat as in the larva shown in Fig. 22), and in some species of the genus *Hydropsyche,* for example, there are two gular sutures (with a broader sclerite between) while in other species of the same genus, there occurs an overgrowth of the gular region resulting in the formation of a single suture in this region, so that this feature is not one of importance in indicating the relationships, or lack thereof, between the Trichopterous larvae, and consequently should not be given much weight in studying the affinities of Dipterous larvae either.

The paragular region *pg* of Figs. 6, 21, and 15, of the larva of *Protoplasa,* is a very unusual structure, and resembles the sclerite I have referred to as the paragula in a Hepialid larva (Fig. 31, Pl. 4, Vol. 19, of the Annals Entomological Society of America for 1921) though the region labelled *pg* in the *Protoplasa* larva may possibly be connected with the cardo. The region labelled *st* in the maxilla of *Protoplasa* (Fig. 15) is probably the stipes, though it may represent the distal portion of the stipes *ds* of a Trichopteron larva (Fig. 22) if the basal region of the stipes is fused with the sclerite *pg* in Fig. 15. The lobe labelled *m* in the maxilla of *Protoplasa* (Fig. 15) is probably largely the galea, since the galea is the maxillary lobe best developed in the adult Diptera, but for the sake of convenience, I shall refer to it simply as the "mala," borrowing this usage from the Coleopterists.

In the Bibionid larva shown in Fig. 18, both the "mala" *m* and the maxillary palp *mp* are borne on a region traversed by a narrow sclerite labelled *s* in Fig. 18. This sclerite may be a part of the cardo (i.e., like the slender cardine sclerite labelled *ca* in the Neuropteron larva shown in Fig. 20), but I am inclined to consider that the slender sclerites labelled *s* in the Bibonid larva (Fig. 18) and in the larva of *Panorpa* also (Fig. 19) represent the slender sclerite of the stipes region labelled *s* in the Trichopteron larva shown in Fig. 22; and if this is the case, the cardo is obsolete in the larvae shown in Figs. 18 and 19. The composition of the maxilla of the Ptychopterid larva shown in Fig. 17 is more like that of the Bibionid larva shown in Fig. 18, than it is like the maxilla of *Protoplasa* (Fig. 15) or a Psychodid larva either, and the maxillae are rather disappointing structures for studying the affinities of Dipterous larvae. In fact the mouthparts in general do not furnish the clews to the relationships of the lower Diptera, or to their nearest relatives among the other Holometabola, that I had hoped might be the case. I simply cannot understand why the mandibles of *Protoplasa* (Fig. 3) should be more like those of a Bibionid (Fig. 5) and both of these like a Trichopteron larva (Fig. 7) when by all the adult indications, the Bibionid larva should lead back to an Anisopodid and thence back to a Trichocerid, and from this type to a Mecopteron, but the Bibionid mandible (Fig. 5) is not suggestive of that of a Trichocerid (Fig. 4), though the Trichocerid has tufts of hair suggestive of the prototype of the brush *b* of the Bibionid (but not in the right position to be the precursors of the brush *b* of the Bibionid), and the *Protoplasa* mandible (Fig. 3) is not like the *Panorpa* mandible shown in Fig. 1. In referring to the mandible of the larva of *Protoplasa* (Fig. 3) it should be noted that one of the seta labelled *l*, has become very scale-like (see *l* of Figs. 21 and 6 also), and is a prominent feature of the mandibular surface that may prove to be of some interest. The basal labial sclerite *gm* (Fig. 16) is rather peculiar, and the narrow transverse sclerites behind it appear to be connected with it beneath the membranous integument, so that although at first sight these narrow transverse sclerites appear to represent cervical sclerites, I am more inclined to regard them as portions of the basal labial plate *gm* in *Protoplasa* (Figs. 16, 21 and 6). It is disappointing that the true labial portion of the underlip, bearing the labial palpi, etc., is not sufficiently developed to be readily detected in *Protoplasa* since I had hoped that the larva would give some indication of the development of the labial palpi, which are the main features of the pupal underlip in *Protoplasa*. The larva of the Ptychopterid shown in Fig. 17, exhibits some indications of the development of the labial palpi in a rudimentary condition (i.e., like those of some Trichopterous larvae, such as the one shown in Fig. 22), and the larval Anisopodoids show traces of the labial palpi, but none of the Diptera have them as well developed as they are in the larva of *Panorpa* (Fig. 19) or in certain Trichopterous larvae, and those of other Holometabola. The labium of the Bibionid larva shown in Fig. 18, bears latero-dorsal extensions (*le* of Fig. 18) which are directed " mesad " and are hence not seen from the exterior. These appear to be of some interest for the interpretation of the parts of the labium in lower Diptera, but I have not as yet determined their homologies definitely, since I have not as yet been able to obtain the Trichopterous larval types which will probably aid in the identification of these structures in the Diptera.

In examining the distribution of the head setae in the larvae of lower Diptera and related Holometabola, it is noteworthy that in *Protoplasa* (Fig. 13) the setae near the frontal sutures *fs* seem to lie laterad of these sutures, while in the Bibionid larva shown in Fig. 31, and in the larva of *Panorpa* shown in Fig. 30, the setae near the frontal sutures *fs* are situated within (mesad of) these sutures, and in the larval Trichoptera this seems to be the case also. There is some dispute as to which sclerites of the larval head represent the clypeal region, the frontal region, etc. (the so-called adfrons of Lepidopterous larvae is considered by Snodgrass as a frontal region, while the so-called frons of these larvae is interpreted as the clypeus by him) and until the muscle attachment in these regions has been more thoroughly investigated in the larvae of lower Diptera, Mecoptera, Trichoptera, etc., and until more intermediate types of larvae have been compared together, it will not be possible to determine definitely the real homologies of the sclerites of this region of the head, so that a comparison of the setae of the head of *Protoplasa* with those of other larvae (particularly with those of the Lepidoptera) can be more advantageously studied later. I would point out the fact that the " frontal-pit setae " or " frontocaval setae " [i.e.,those in the neighborhood of the frontal pits *fp* (Figs. 13, 14, 12, etc.)] are very constant, and may be of especial interest in a comparative study of the setae of the various larvae. The setae of the thoracic region of *Protoplasa* will be compared with those of other larvae in a later paper, but I would mention at this time the pair of setae in the neck or presternal area just behind the transverse sclerites belonging to the basal labial plate (*gm* of Fig. 6), and also the groups of ventral setae labelled *as* in Fig. 6. The ambulatory setae *as* (usually in groups of three—occasionally four) may mark the region homologous with the legs of the pupal *Protoplasa,* but this is mere conjecture, and the interpretation of the areas about these setae must await further investigation.

The " pseudopods " or posterior, leg-like structures of the larval *Protoplasa* shown in Figs. 24 and 27 are of interest because they are very similar to those of a Chironomid larva. These posterior " pseudopods " of *Protoplasa* bear gills, labelled *gi* in Figs. 24 and 27, but the most interesting features are the sixteen lateral setae labelled *s* in Figs. 24 and 27, and the seven hooks labelled *h* in Fig. 27. When the muscles attached to the central region (represented by a central depression near the tip of the pseudopod in Fig. 24) contract, the lateral setae *s* are drawn together, and the hooks *h* of Fig. 27 come into play. I think that these hooks and setae are for creeping about, although the fan-like arrangement of the long setae (when expanded) suggests a swimming function or a structure for leaping backward. In the two types of Chironomid larvae shown in Figs. 25 and 26, the hooks *h* of Fig. 25 are replaced by the seta-like structures *s* of Fig. 26 (all of these setae were not drawn), and this suggests that the hooks are modified setae (or *vice versa*). The pseudopods of the larvae of *Protoplasa* and the Chironomids are more nearly alike than is the case in any other Dipterous larvae I have seen, and this may be taken to indicate that the Chironomids were derived from *Protoplasa*-like forebears, but I am not yet ready to give up the idea that most of the Nematocerous Diptera (other than the Psychodoids—Ptychopterids, Tanyderids and Psychodids—and the Tipulids) were derived from *Anisopus*-like ancestors leading back to the Tanyderidae, although it must be admitted that this derivation is based for the most part on adult characters alone (but a comparative study of the more inclusive groups, such as the orders, etc., has indicated that the adult characters are the most reliable and important).

I have not been able to determine the homologies of the "pseudopods" of *Protoplasa* (Figs. 24 and 27) although Dr. Alexander has suggested to me that they are homodynamous (serially homologous) with the crochet-bearing abdominal "pseudopods" borne on abdominal segments three to seven (inclusive) in the larva of the Tipulid *Dicranota* described by Miall, 1893, on page 235 of the Transactions of the Entomological Society of London for 1893. These "pseudopods" are strikingly similar to those of Lepidopterous larvae, and are probably homologous with them, and if the posterior "pseudopods" of *Protoplasa* are homologous with these, the posterior "pseudopods" of *Protoplasa* doubtless represent the larval "postpedes" of caterpillars. In examining the terminal structures of a larval Tipulid such as *Eriocera* (Fig. 29) it occurred to me that the ventral pair of posterior processes, which bear long setae as shown in Fig. 29, might be homologous with the posterior "pseudopods" of *Protoplasa*, and this possibility should be further investigated with a view to bringing these ventral processes with their setae, into line with the posterior " pseudopods " of *Protoplasa* and the abdominal " pseudopods " of *Dicranota.* There are also protrusile, seta-bearing structures borne at the end of the abdomen in Psychodid larvae, but I do not think that these can be brought into line with the other structures mentioned above. On the other hand, a systematic study of the terminal abdominal structures of larval Diptera should lead to some interesting results, and would apparently lend support to the view that Psychodid larvae (with their cylindrical posterior structures) are like the prototypes of the larvae of Dixids, Culicids, etc., and on this account would be of considerable importance from the standpoint of the phylogenetic arrangement of the Dipterous families. I am hoping to be able to complete my series of larvae illustrating the comparative anatomy of the terminal abdominal structures in the near future.

ABBREVIATIONS.

a....Antenna.
ac...Anteclypeus (anterior region of clypeus).
as...Ambulatory or podal setae.
b....Brustia or gnathobrustia (homologous with prostheca?).
c....Coronal suture (stem of epicranial suture).
ca...Cardo.
ce...Condyle of mandible (gnathocondyle).
cl... Clypeal sclerites (clypeites).
ds...Dististipes (distal region of stipes).
e....Eye, larval eyes.
es... Epipharyngeal brushes (labrobrustia).
ex...Extensor tendon of mandible.
f....Frons or front.
fl....Flexor tendon of mandible.
fp...Frontal pits (frontocavae) marking position of anterior arms of tentorium.
fs... Frontal sutures (arms of epicranial suture).
g....Ginglymus.
gi... Gill.
gm.. Labial sclerite (gulamentum or postlabium).
gu...Gula.
h....Hooks of pseudopod.
i.... Incisors of mandible.
l.... Mandibular scale (gnatholepis).
le... Dorso-lateral extension of labium.
lr... Labrum.
lp... Labial palpi.

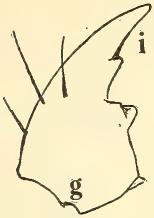

Fig. 1

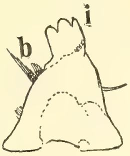

Fig. 2

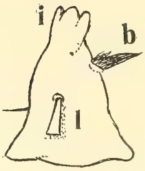

Fig. 3

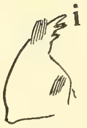

Fig. 4

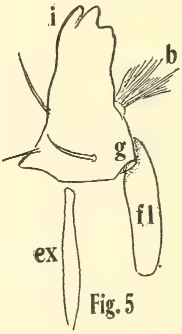

Fig. 5

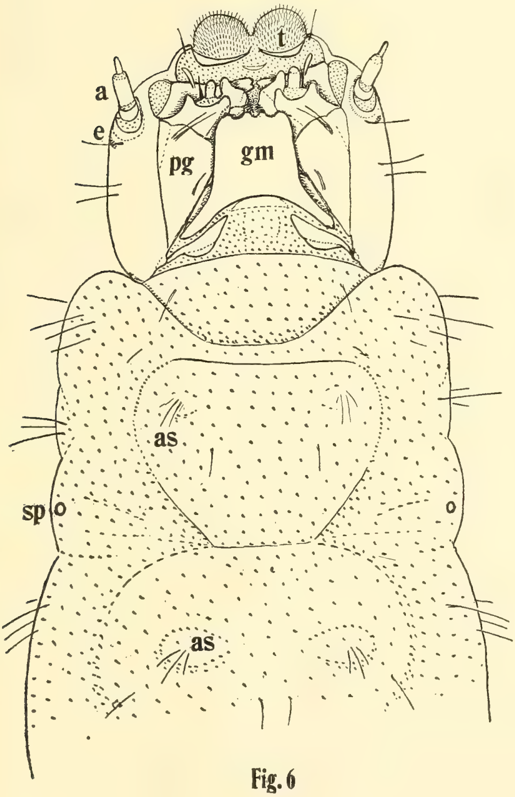
t
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Fig. 6

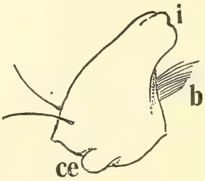

Fig. 7

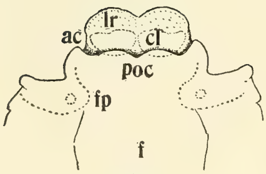
lr
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Fig. 8

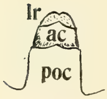

Fig. 9

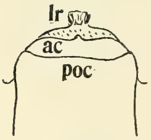

Fig. 10

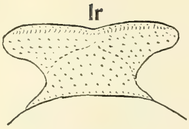

Fig. 11

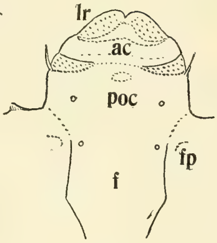
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Fig. 12

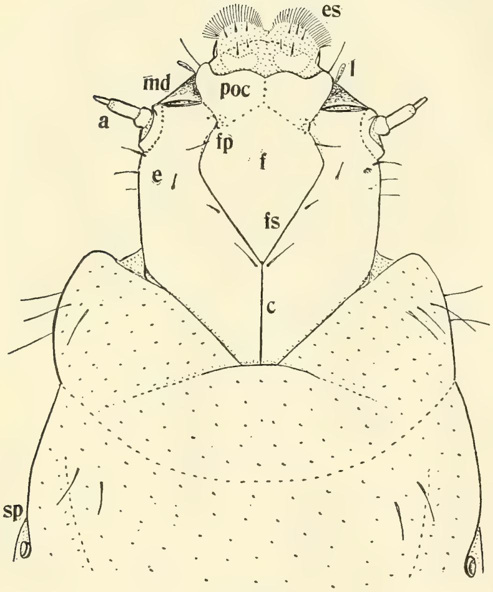
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Fig. 13

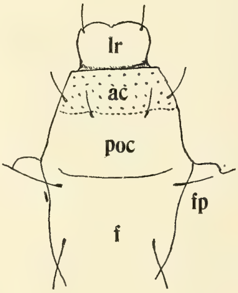
lr
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Fig. 14

m... Maxillary mala (galea).
md.. Mandible.
mg.. Midgular or epigular suture.
mp.. Maxillary palpus.
pg... Paragula (postgena?).
poc.. Postclypeus (posterior region of clypeus).
s.... In maxillary region denotes stipital sclerite (transtipes).
s.... In pseudopod denotes long setae (longisetae).
sm.. Submentum.
sp... Spiracle.
st... Stipes.
t.... Tormae.

EXPLANATION OF PLATES XV–XVIII.

Fig. 1. Anterior view of sinistral mandible of a larva of the Mecopteron *Panorpa.*
Fig. 2. Posterior view of the sinistral mandible of the larva of *Protoplasa.*
Fig. 3. Anterior view of same.
Fig. 4. Mandible of larval Trichocerid.
Fig. 5. Mandible of larval Bibionid.
Fig. 6. Ventral view of head, prothorax and mesothorax of a larval *Protoplasa.*
Fig. 7. Mandible of larva of Phryganid (Trichopteron).
Fig. 8. Dorsal view of anterior region of head of *Protoplasa* larva.
Fig. 9. Same of Psychodid larva.
Fig. 10. Same of Ptychopterid larva.
Fig. 11. Same of caddice fly larva.
Fig. 12. Same of Bibionid larva.
Fig. 13. Dorsal view of head, prothorax and mesothorax of *Protoplasa* larva.
Fig. 14. Dorsal view of anterior region of head of *Panorpa* larva.
Fig. 15. Ventral view of dextral maxilla of *Protoplasa* larva.
Fig. 16. Ventral view of labial sclerite of *Protoplasa* larva.
Fig. 17. Ventral view of dextral maxilla and labium of Ptychopterid larva.
Fig. 18. Ventral view of dextral maxilla, labium and portion of ventral region of head capsule of Bibionid larva.
Fig. 19. Same of larval *Panorpa.*
Fig. 20. Same of larval *Rhapidia* (Neuropteron).
Fig. 21. Lateral view of head, prothorax and mesothorax of larval *Protoplasa.*

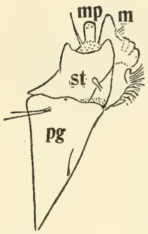

Fig. 15

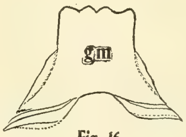

Fig. 16

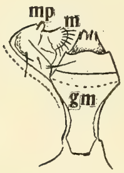

Fig. 17

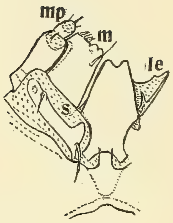

Fig. 18

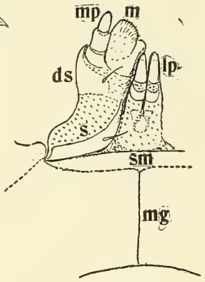
mp
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Fig. 19

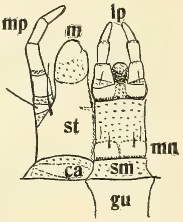
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Fig. 20

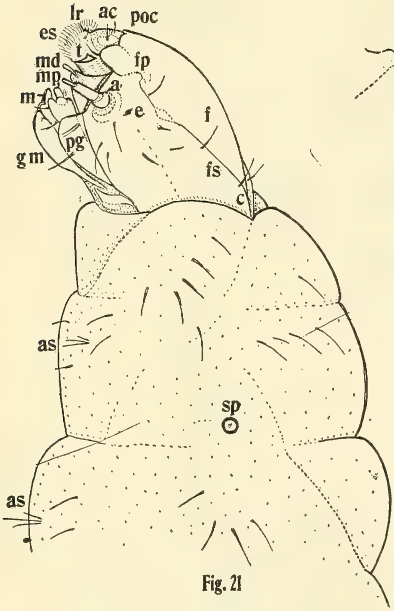
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Fig. 21

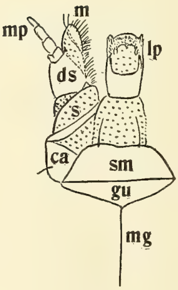
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Fig. 22

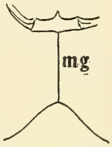

Fig. 23

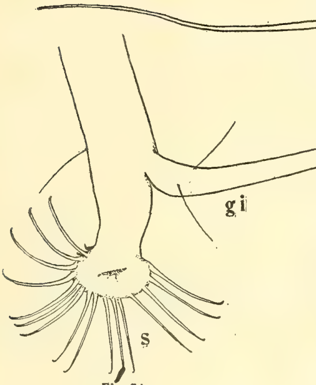

Fig. 24

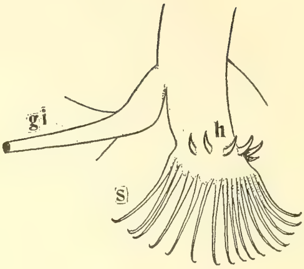

Fig. 27

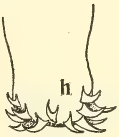

Fig. 25

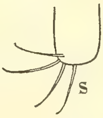

Fig. 26

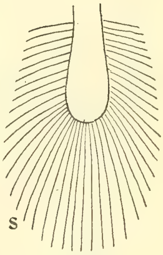

Fig. 28

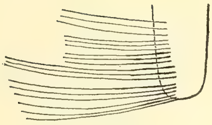

Fig. 29

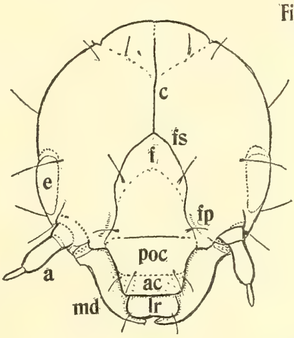
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Fig. 30

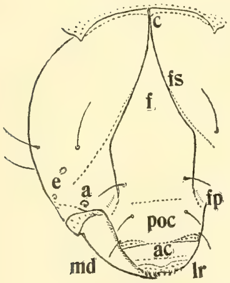
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Fig. 31

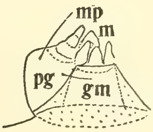


Fig. 32

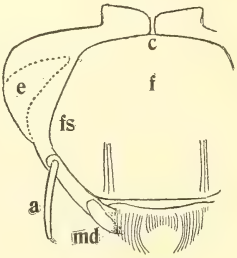


Fig. 33

Fig. 22. Ventral view of dextral maxilla, labium and portion of ventral region of head capsule of larval caddice fly.

Fig. 23. Ventral view of median portion of head and basal portion of labium of larval Psychodid.

Fig. 24. Lateral view of sinistral "pseudopod" (one of the "postpedes") of larval *Protoplasa*.

Fig. 25. Pseudopod of one type of Chironomid larva.

Fig. 26. Pseudopod of another type of Chironomid larva.

Fig. 27. Mesal view of sinistral "pseudopod" of larval *Protoplasa*.

Fig. 28. Protrusile, seta-bearing posterior appendage of Psychodid larva.

Fig. 29. A ventral posterior process of a larval *Eriocera*.

Fig. 30. Frontal view of head of larval *Panorpa*.

Fig. 31. Frontal view of dextral half of head of larval Bibionid.

Fig. 32. Ventral view of dextral maxilla and labium of larval Mecopteron *Boreus*.

Fig. 33. Frontal view of dextral half of head of larval Culicid.

THE NAMES OF CERTAIN RHYNCHOPHORA.

By J. Chester Bradley, Cornell University, Ithaca, N. Y.

Among other nomenclatorial changes that it has seemed necessary to make in connection with the preparation of a forthcoming Manual of the genera of beetles known to occur in America north of Mexico, there are some which require explanation. These are the cases which I here wish to discuss.

The Family and Subfamily Names of the Broad-nosed Weevils.

Billberg, 1820, by the use of the name Anthribides, intended to constitute *Anthribus* the type genus of the broad-nosed weevils. But Pierce, '16, has shown that *Anthribus* Geoffroy, 1762, is not identifiable as a rhynchophorid genus. Consequently it is not available as type genus of a family of weevils, and the designation of Billberg, 1820, will not apply to the beetles under consideration. So far as I am aware, the next type designation was by Thomson in 1859. This author divided the family *Anthribidae* as follows:

I. Subfamily Urodontides.
II. Subfamily Anthribides.
  a. Tribe Choragina.
  b. Tribe Brachytarsina.
  c. Tribe Anthribina.

Although *Urodon* is retained in the family "Anthribidae" by Wolfrum, '29 (Coleopterorum Catalogus), Dr. Carl Jordan, '24, has shown abundant and conclusive evidence for removing it to the Mylabridae. It therefore may be ruled out as a possible type genus for the broad-nosed weevils.

There remain the Brachytarsina of which the type genus is *Brachytarsus* Schönherr, 1826, and the Choragina of which the type genus is *Choragus* Kirby, 1818. Each of these genera are to-day recognized as valid and within the family. Each in fact represents a distinct subfamily. As they are of the same date, the only choice between them is by page precedence, and thereby falls on *Choragus* and the family name will be Choragidae. This has the advantage of not being an unfamiliar group name, Choragina having been used after Thomson by Fowler, 1890, and Choragini by Bedel, 1882, and Reitter, 1916, as subtribe, tribe or subfamily names.

Doctor Jordan, '06, has been followed by Wolfrum, '29, in using Pleurocerinae and Anocerinae for the names of the two subfamilies. But these are descriptive names, not based on a contained genus, and hence unavailable under the code. On basis of the facts stated in the preceding paragraph, Choraginae becomes available and must be used in lieu of " Anocerinae " and Brachytarsinae in lieu of " Pleurocerinae."

CHORAGIDAE.
  (Anthribidae auctt.)
  (Platyrrhinidae Bedel, '82; Fowler, 1891, 1892; Everts, '03)
  (Platystomidae and Choragidae Pierce, '16)
  (Platystomidae Leng, '19)
a. Subfamily BRACHYTARSINAE.
    (Tribe Brachytarsina Thomson, '59)
    (Pleurocerinae Jordan, '06; Wolfrum, '29)
    (Anthribides pleuroceres Lacordaire, '66)
    (Anthribini Seidlitz, '91; Reitter, '16)
    (Tropiderini and Anthribini Leng, '19)
b. Subfamily CHORAGINAE
    (Tribe Choragina Thomson, '59)
    (Anocerinae Jordan, '06; Wolfrum, '29)
    (Anthribides anoceres Lacordaire, '66)
    (Choragini Bedel, '82; Reitter, '16)
    (Araeocerini Seidlitz, '91)
    (Araeocerini and Xenorchestini Leng, '19)

THE RHINOMACERINAE, RHYNCHITINAE AND ATTELABINAE.

Voss, '22, has united the first two subfamilies under the name of Rhynchitinae. This subfamily he divides into four tribes: 1. Rhinomacerini, 2. Allocorynini, 3. Auletini, 4. Rhynchitini.

Des Gozis (Bull. Soc. Ent. de France, 1881, p. cxii) drew attention to the fact that *Rhinomacer* Fabr., 1787, is a homonyn of *Rhinomacer* Geoffroy, 1762, and proposed *Cimberis* as a substitute name. Pierce, '16, accepts *Cimberis* as the valid name of the genus. But in dealing with the higher group names based on *Rhinomacer,* he has without warrant changed the type genus from *Rhinomacer* Fabr., 1787, to *Doydirhynchus* Dejean, 1821. It is, however, necessary to retain the original type genus, and under Art. 5 of the Code, to change the higher group names to correspond to the change in the genus name (which is a very different matter from changing the genus). Rhinomacerini thus becomes Cimberini, and Rhinomacerinae becomes Cimberinae.

If we unite the two subfamilies, as Voss has done, then we must do so under the name Cimberinae, because the group dates back to Leach, 1817 (Rhinomaceridae), whereas Rhynchites was not made type of a higher group until by Thomson in 1859.

CURCULIONIDAE.
  Subfamily CIMBERINAE.
      (Rhinomacerinae auctt.)
      (Doydirhynchoidea Pierce, '16, and Attelaboidea, in part, Pierce, '16)
    Tribe CIMBERINI.
      (Rhinomacerini auctt.)
      Doydirhynchoidea, in part, Pierce, '16)

THE TRIBES CEUTORHYNCHINI AND CRYPTORHYNCHINI.

Pierce, '19, has shown that *Cryptorhynchus* Schönherr, 1826, is preoccupied by *Cryptorhynchus* Illiger, 1807. The latter is the genus of the tribe Ceutorhynchini called *Rhinoncus* in Leng's Catalogue. On this account, and since *Cryptorhynchus* Illiger, 1807, is the oldest genus in the tribe, Pierce instead of using the name *Ceutorhynchidae* for the including group, which he terms family, uses *Cryptorhynchidae.* This course seems to be unnecessary. The genus contained within the limits that we assign to the tribe which was first made a type genus for a tribe or higher group was, so far as I am aware, *Ceutorhynchus,* which was used by Thomson in 1859 for his group *Ceutorhynchides.* Ceutorhynchini is therefore, in my view, the acceptable tribal name.

Since the type genus of Cryptorhynchini (in the sense used in Leng's Catalog) is a homonym, under Art. 5 of the Code we must change the name of that tribe. The type genus remains the same, and the tribe changes its name to correspond to the new name of the type genus—in this case Cryptorhynchidius Pierce.

CEUTORHYNCHINI auctt. remains CEUTORHYNCHINI.
CRYPTORHYNCHINI auctt. becomes CRYPTORHYNCHIDIINI, type *Cryptorhynchidius* Pierce = *Cryptorhynchus* Schönherr, 1826, *nec* Illiger, 1807.

THE CORRECT GENERIC NAME OF *Pantomorus godmani* CROTCH.

On page 47 to the Supplement to Leng's Catalogue of the Coleoptera of America north of Mexico, *Pantomorus godmani* Crotch is transferred to *Asynonychus* which is there ascribed to Champion, Entomologists' Monthly Magazine, vol. 58, p. 162, 1922.

Asynonychus was described by Crotch, '67, not by Champion. Champion used *Pantomorus* and meant to refer to *Asynonychus* Crotch as a synonym. Leng's number 16659, *godmani* Crotch, must therefore be restored to *Pantomorus*.

NOTICE.

ENTOMOLOGICA AMERICANA.

As volume XI of ENTOMOLOGICA AMERICANA we are publishing a very full monograph by Dr. A. G. Böving and Dr. F. C. Craighead, on certain beetle larvae, under the title "*An Illustrated Synopsis of the Principal Larval Forms of the Order Coleoptera.*" It will consist of 125 (more or less) line plates of the larvae and their structural details, with complete explanations. It is without doubt a very extensive, and, we believe, very full work on these immature forms. The names of the authors are a guarantee of this. It represents the accumulated labors of years of Dr. Böving and Dr. Craighead, dating from 1915.

This volume of ENTOMOLOGICA AMERICANA will not be sold as a single volume, but only to subscribers to the whole series of our publication, at our stated subscription price of $4 per volume.

However, to meet any outside demand that may arise for this important work, we will have on hand a limited supply of reprints which will be for sale separately. For advance orders before publication, we have fixed a price of $5 per copy, unbound; and $6 per copy, bound; postpaid. Orders will be filled at prepublication prices up to the date of issue for March, 1931—no. 4, volume XI —of ENTOMOLOGICA AMERICANA, which will contain the concluding part of the monograph and also the index. Deliveries of the complete work will be made shortly after the issue of no. 4, vol. XI.

Those interested in this important work should send in their orders promptly to

LIBRARIAN, BROOKLYN ENTOMOLOGICAL SOCIETY,
28 Clubway, Hartsdale, N. Y.,

accompanied by Check in full.

NOTES ON TEXAS BEES

By H. B. Parks, San Antonio, Texas.

Lithurgus.

During the spring of 1928 Mr. Geo. P. Engelhardt, of the Brooklyn Museum, visited this Laboratory. While here he examined the local collection of Hymenoptera and suggested that he take a selection from the group to Dr. Herbert F. Schwarz, of the American Museum of Natural History, for identification. Under the date of Dec. 11, 1928, Dr. Schwarz writes, that among the bees sent is one male of *Lithurgus bruesi* Mitchell, a bee just described by Dr. Theo. B. Mitchell, and as the female is unknown it would be well to collect all of the species seen.

On the advice of Dr. Schwarz, the *Megachile* in the collection here were sent to Dr. Mitchell for determination. In giving the names of the bees sent, he writes on February 5, 1930:

"The most interesting specimen in the lot is the male of *Lithurgus.* It so happens that there was also a single male of this same species in the lot which you sent me previously, and these two are the only specimens other than the type which I have seen. The type was collected at Austin by Professor Brues for whom I named it. This may possibly be the long-tongued Megachilid you mentioned seeing among your specimens, as the tongue of *Lithurgus* is extremely long."

Accompanying Dr. Mitchell's original description of *L. bruesi* M. is this note.

"Type: Male (Type No. 15710, Mus. Com. Zool.); Austin, Texas (C. T. Brues collector)."

According to this information there were on February 5, 1930, the followwing known specimens of *L. bruesi:*

1. The type.

2. A specimen collected at the Laboratory, but in the collection of Dr. Mitchell.

3. Two specimens, one identified by Schwarz and one by Mitchell in the collection here. The type and the two specimens here bear no date, the one in the Mitchell collection has a date of April 27, 1929. All specimens are males.

This information was the incentive for an intensive, prolonged, but successful search. The local collections of insects as well as those at the University of Texas and A. & M. College furnished no other specimens. Dr. Mitchell suggested that as *Lithurgus gibbosus* was found on cactus flowers, *L. bruesi* also might be found there. A review of the literature showed that Cresson reported three species, *Lithurgus gibbosus* Sm., *L. compressus* Sm., and *L. apicalis* Cress. from Texas, yet no species of *Lithurgus* is listed in "Hymenoptera Texana," the bulk of whose mentioned species were collected in this part of Texas. It was therefore apparent that there were two species to look for.

The first of the cacti comes into bloom here about March 1st, and a succession of species furnish continued bloom until June 15th. Preparation was made to collect specimens of all insects visiting the cacti blooms during the spring of 1930. The spring was backward. The weather report shows that the temperature was much below normal and the number of cloudy days as well as the number on which rain fell much above normal. Nevertheless, the rainfall was far below normal. All these conditions were adverse to bees and cacti, both of which like hot sunshine and lots of it.

Although many bees were captured *Lithurgus* was not found until May 12th, when *Opuntia lindheimeri,* our most numerous cactus, was at the end of its bloom. The final count of its insect visitors was being made to get the per cent. of *Apis mellifica* L., when late in the afternoon a number of specimens of *Lithurgus* were captured. The next day no *O. lindheimeri* flowers opened, but *Lithurgus* was discovered collecting pollen on *Opuntia ellisiana,* the cultivated spineless cactus. The afternoon of the same day this bee was caught sucking nectar from *Monarda* and *Vitex.* All species of plants in bloom were watched and all-day observations made. No new food plants were found. The last *Lithurgus* was seen on June 4th, the same day *O. ellisiana* dropped its last bloom.

Table 1 gives the list of plants observed, their blooming dates, and number of species of insect visitors.

Table 2 the dates of capture of *Lithurgus* and the numbers of each sex.

Table 3 the dates of blooming and capture of *Lithurgus.*

As soon as a series of *Lithurgus* was collected it was easily seen that there were at least two and perhaps more species or forms present. A selection sent to Dr. Mitchell confirmed this belief, as *L. gibbosus* composed about half the material and *L. bruesi* the remainder. *L. compressus* was thought to be present and was, as Dr. Mitchell writes that this is a synonym for the male of *gibbosus*. Thus in this intensive search two species, one not taken before, at this Laboratory, and the unknown female of *bruesi* have been found.

The general appearance of the two species is so close that it is impossible to tell them apart on the flowers. The female on alighting in a cactus flower rests on the stamens for an interval then pushes her head against the pistil column and goes down to the nectary at the base. While in this position the legs and plates of the abdomen are worked combing out the pollen. While thus occupied the bees are easily captured by placing the killing bottle over the flower. In the series secured this spring the net was never used on cactus flowers. The male will alight on the cactus flowers, go around the pistil looking for a female, and if none is present will clasp the pistil column, head up and remain motionless for several minutes. They too are most easily taken by placing the bottle over them. The pollen of cactus is mostly gone by noon and the flowers close early. None or very few *Lithurgus* were taken on cactus after 12:00 noon.

In the afternoon both males and females collected nectar on *Monarda* and *Vitex*. On these plants they were very wild and hard to catch. From the large amount of pollen collected, nests must have occurred in the vicinity but a detailed search failed to find them. These bees fly very rapidly and could not be "coursed" like honey bees.

Owing to the fact that seven years of collecting here produced only four males of this genus and that no specimens could be found in nearby Texas collections, and that this year, in three weeks' time, one hundred and twenty-nine specimens representing two species including the undescribed female of *L. bruesi* Mitchell were taken, leads to the conclusion, supported by other evidence, that certain insects are governed in their life activities by peculiar optimum weather conditions, so that when this condition exists they are present. When the condition does not exist they continue in the pupal stage until the reoccurrence of this condition, be it one or many years.

TABLE I.

List of Plants Observed, Blooming Dates and Insect Visitors.

Plant	In Bloom—Out of Bloom	No. Species of Insect Visitors
Mamillaria heyderi Muhleuff	March 25–April 10	5
Echinocactus texensis Hoepf.	April 10–April 17	6
Echinocactus caespitosus Engl. and Gray	April 10–April 16	2
Opuntia macrorhiza Engelm.	April 25–May 10	8
Opuntia lindheimeri Engelm.	April 15–May 12	8 including Lithurgus
Opuntia leptocaulis D. C.	May 14–June 15	5
Opuntia ellisiana Griff.	May 13–June 4	7 including Lithurgus
Echinocactus setispinus Engelm.	June 1–June 4	4 " "
Monarda punctata L.	April 16–May 23	10 " "
Monarda citriodora Cerv.	April 16–May 23	10 " "
Vitex negundo incisa	April 20–June 5	18 " "

TABLE II.

Distribution, Percent of Sex, and Weather Relation.

Lithurgus gibbosus Sm.			*Lithurgus bruesi* Mitchell			
Date	♀	♂	♀	♂	Total	Weather
May 12	1	7	2	3	13	Cloudy
13	2	2	1		5	Cloudy
14	2	5	2		9	Cloudy
15	6	5	1	1	13	Part Cloudy
16	1		4		5	Cloudy
17						Cloudy, Rain
18						Part Cloudy, Rain
19	1	4	3		8	Clear
20	4		9		13	Clear
21						Part Cloudy
22	5	1	12	2	20	Clear
23	2				2	Part Cloudy
24	2		1		3	Part Cloudy
25	1				1	Clear
26	11	1	1		13	Clear
27	6		4		10	Part Cloudy
28						Rain, Cloudy
29	1		1		2	Cloudy
30	2				2	Part Cloudy
31	4		3		7	Cloudy
June 1	1	1			2	Clear
2						Part Cloudy
3						Clear
4	1				1	Part Cloudy
					129	

TABLE III

	May																				*June*			
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4
Total	13	5	9	13	5			8	13		20	2	3	1	13	10		2	2	7	2			1
Opuntia lindheimeri Engelm.	—																							
No. Lithurgus ...	13																							
Opuntia ellisiana Griff.																								
No. Lithurgus ...		3	5	5	3			4	13		20	2	3	1	13	10		2	2	7	2			1
* Opuntia leptocaulis D. C.																								
No. Lithurgus ...																								
Monarda punctata L.																								
No. Lithurgus ...		1	2	3				1																
Monarda citriodora Cerv.			1	3	1			2																
Vitex negundo incisa																								
No. Lithurgus ...		1	1	2	1			1																

* Opuntia leptocaules D. C. is carried in this table because it was in bloom during the flight of Lithurgus, but no specimens were seen on this plant.

NOTES ON AMERICAN TINGITIDAE (HEMIPTERA).

By Carl J. Drake, Ames, Iowa.

Further study of collections of American Tingitidae has made it necessary to erect two new genera, describe two new species, rename one species, and suppress two species as synonyms. The descriptions and notes on the homonym and synonyms are given below.

Acalypta duryi n. name.

This name is proposed for *Acalypta* (=*Drakella* Bergroth =*Fenestrella* Osborn and Drake) *ovata* Osborn and Drake, the specific name of *ovata* being preoccupied and a homonym in the genus *Acalypta* Stål. As yet this species has been recorded only from the type locality, Cincinnati, Ohio; it is represented by three brachypterous specimens, collected by Mr. Chas. Dury.

Acalypta saundersi (Downes).

Many brachypterous examples, Puyallup, Washington, March, 1929, collected on moss, by Mr. Wm. W. Baker. Up to the present time this remarkable species has been known only from a brachypterous female, holotype, Goldstream, B. C., collected in a low marsh area by Mr. L. G. Saunders. Male a little more slender than the female; claspers large and strongly curved; other characters very similar to female. It is most closely allied to the foregoing species, *A. duryi* Drake, but very distinct as pointed out by Downes in his original description. *Allotype,* brachypterous male, Puyallup, Wash., in writer's collection. The long-winged form is unknown.

Corythaica bellula Bueno.

Corythaica bellula Bueno, Bull. Brookl. Ent. Soc., XII, 1917, p. 19.
Corythaica bellula Blatchley, Heter. East. N. A., 1926, p. 471.
Corythaica floridana Blatchley, Heter. East. N. A., p. 471.

The holotype (brachypterous) in Blatchley's collection has been examined. It is identical with similar winged forms of *bellula* from New York and should be treated as a synonym of Bueno's species. *Bellula,* as represented by brachypterous and macropterous specimens, shows a considerable variation in size and color. Through the kindness of J. R. de la Torre-Bueno and Chris.

Olsen many specimens, including the types of *bellula,* have been studied. The species of *Corythaica* are greatly confused in the literature, especially the species occurring in the West Indies and South America.

Melanorhopala clavata Stå.
- *Melanorhopala clavata* Stål, Enum. Hemip., III, 1873, p. 130.
- *Melanorhopala lurida* Stål, Enum. Hemip., III, 1873, p. 131.
- *Melanorhopala uniformis* Stål, Enum. Hemip., III, 1873, p. 131.
- *Melanorhopala obscura* Parshley, Psyche, XXIII, 1916, p. 167.
- *Melanorhopala reflexa* Blatchley, Heter. East. N. A., 1924, p. 492.
- *Melanorhopala clavata* Blatchley, Heter. East. N. A., 1926, p. 492.
- *Melanorhopala clavata* Drake, Ann. Carn. Mus., XVI, 1926, p. 377, pl. XXIV, figs. *a, b, c.*

The holotype of *reflexa* in the Blatchley collection has been examined, and without a doubt it represents an extremely long-winged form of *clavata.* Sexual dimorphism of the antennae and pterygopolymorphism cause marked changes in general appearance, size and modification of certain structures. Macropterous individuals are represented by long-winged and extremely long-winged individuals, the latter being very rare in collections and identical with the form described by Blatchley as *reflexa.* The three different types of wings are represented in a long series of specimens collected on weeds near Chicago, Illinois, by Mr. William J. Gerhard. The writer has also collected this form in the prairies at Ames, Iowa. However, most series of specimens contain but two forms, either the short- or the usual type of long-winged individuals. The third segment of the antennae is slightly clavate in the male and strongly clavate in the female. In the latter the fourth segment is also thicker at the base. In the brachypterous specimens the elytra are acute posteriorly with their tips distinctly separated.

Allotingis n. gen.

Head short, distinctly tumid above, with the three frontal spines arranged as in related genera. Bucculae broad, long, contiguous in front, extending anteriorly in front of head.

Coxae widely separated; rostral laminae not strongly developed, almost cariniform; rostral channel broad, uninterrupted; rostrum extending on the mesosternum. Antennae long, slender, widely separated at base; segment I very long, longer than head, a little stouter than II; III very slender, rather long. Antenniferous tubercles very long, slender.

Pronotum moderatly swollen, finely and closely pitted, unicarinate; posterior projection short and rounded; collum long, conspicuous; paranota reticulate, expanded laterally, projecting anteriorly beyond collum. Elytra about one-third longer than abdomen; not overlapping, meeting in an almost straight (very slightly rounded) line along the median line of abdomen; areolae moderately large, hyaline; discoidal and sutural areas not very clearly differentiated; costal and subcostal distinct. Wings greatly reduced or wanting.

Type of genus, *Leptobyrsa binotata* Drake and Bruner, from Cuba. This genus is most closely allied to *Leptobyrsa* Stål, but differs from it in the characters of bucculae, collum, pronotum, shorter and more closely reticulated elytra, and longer basal segment of antennae. The bucculae project very strongly obliquely forward and downward from the base of the tylus, thus extending considerably in front of the head. The male genital characters are also quite different.

Liotingis n. gen.

Pronotum closely and finely pitted, slightly swollen, strongly narrowed in front, tricarinate. Collum very large, distinctly marked off, finely reticulate. Paranota projecting almost laterally, scarcely reflexed, extending anteriorly a little beyond collum. Antennae long, slender; segment I long, considerably thickened, longer than head, the second segment very short; III very long, slender; IV long and slender. Antenniferous tubercles very long, slender, straight; divaricating, spine-like in appearance. Head short, with five spines. Bucculae large, closed in front not extending anteriorly in front of head; rostral channel uninterrupted, open behind, the laminae widely separated on mesosternum. Orifice indistinct. Legs long and slender. Elytra considerably longer than abdomen, overlapping, the areas distinctly marked off; discoidal area reaching to middle of elytra. Wings present.

Genotype, *Liotingis evidentis* n. sp., from Brazil. This genus belongs to the distinctly lacy group of Tingitidae. It is perhaps most closely related to the genus *Allotingis* Drake, but readily separated from it by the extremely long, divaricating, spine-like antenniferous tubercles, the overlapping elytra, and character of the bucculae. The antenniferous tubercles separate *Liotingis* from *Leptopharsa* Stål and other closely related genera.

Liotingis evidentis n. sp.

Moderately large, almost flat in appearance, testaceous, the head and body brown. Antennae very long, slender, with long bristle-like hairs; segment I very long, brown, moderately swollen, thickest near the middle, between four and five times as long as two; III long, slender, slightly curved, testaceous, about three and one-half times as long as four; IV very long, slightly enlarged, mostly black. Rostrum extending to middle of mesosternum. Antenniferous tubercles very long, rather sharp, spine-like, divergent. Head with five sharp spines; anterior pair long, directed anteriorly, contiguous at apex; median short, slender, not prominent; posterior pair longest, directed forward, contiguous with head, extending to base of anterior pair. Eyes small, transverse, brown.

Collum very large, reticulate, subtruncate in front, slightly raised in the middle. Paranota moderately broad, almost rectilinear, uniseriate along humeri, bi-triseriate in front, acutely produced in front and extending to middle of eyes; outer margins almost straight, converging anteriorly. Carinae indistinctly areolate; median slightly more elevated and more strongly raised on collum; lateral ending anteriorly at collum, parallel. Elytra about one-third longer than abdomen, broadly rounded behind, the tips separated; discoidal and sutural area slightly and jointly elevated; costal area broad, biseriate at base, triseriate at widest part, the areolae not very regularly arranged; subcostal area rather narrow, uniseriate, strongly sloping obliquely downward; discoidal area large, almost elongate-elliptical, narrow at both ends, with four rows of areolae at its widest part, with a black-fuscous spot a little behind the middle on the costate nervure forming outer boundary. The margins of elytra, paranota, carinae, and enlarged nervures marking off areas of elytra indistinctly serrate. Wings a little longer than abdomen, faintly clouded. Legs long, slender, testaceous. Length 2.97 mm.; width 1.29 mm.

Holotype, female, Minas Geraes, Brazil, in collection of writer.

Leptopharsa lenatis n. sp.

Elongate, fuscous-black. Antennae and legs dark fuscous-black, somewhat polished; areolae of hood and sutural and discoidal areas clouded with fuscous; those of paranota, carinae, and costal and subcostal areas translucent. Head black, with five rather long, slender, dark brown spines, the median longest. Antennae long, slender, indistinctly pilose; segment I rather long, slightly curved, considerably swollen, two and a half times as long as two, the latter shorter and slenderer; III very long, three times as long as four; IV long, slightly swollen, pilose, considerably longer than one and two taken together. Bucculae black, margined with testaceous, closed in front. Rostrum long, brownish, extending to the end of metasternum. Rostral laminae strongly developed, reticulate, mostly testaceous, open at apex. Body beneath black.

Pronotum strongly narrowed anteriorly, coarsely pitted, reticulate behind, tricarinate. Carinae strongly foliaceous, each composed of one row of large areolae; lateral carinae parallel, rounded above, long, not touching sides of hood; median more strongly elevated, abruptly raised a little behind the hood. Paranota moderately broad, biseriate, strongly recurved, the areolae rather large. Hood moderately large, projecting slightly over base of head, sub-globose. Elytra considerably longer than abdomen, rounded behind, widest a little behind the base; their tips not separated when at rest; costal area rather broad, mostly biseriate, triseriate at widest part; subcostal area broad, almost vertical, bi-triseriate; discoidal area large, widest near middle, the outer nervure costate and strongly raised, narrowed behind. Wings longer than abdomen, somewhat clouded. Legs long, slender, polished. Length, 4.24 mm.; width, 1.41 mm.

Holotype, female, Perú, S. A., in writer's collection. *Paratype,* female, Santarem, Brazil, Carnegie Museum; is a little lighter in color than the type. Differs from *L. peruensis* Drake and *distinconis* Drake in color, position of elytra when at rest and several structural characters as noted in descriptions.

A MELANIC FORM OF TELEA POLYPHEMUS.

By C. Wm. Wurster, New York, N. Y.

The specimen of *Telea polyphemus* (Cramer), described here as a new aberration, differs from the normal in having a large portion of the ground color of all the wings, above and below, black or blackish.

Telea polyphemus ab. fumosus n. ab. (Pl. XIX.)

Primaries, upperside: costal area and area, except as noted, between the subbasal and submarginal bands, black, most intense in costal and subapical areas. The distal portion of veins basad of submarginal band are deeper black than ground color. Area between subbasal and submarginal bands from inner margin to Cu_2, base of cellule $Cu_2 - Cu_1$, and in the cell between subbasal band and ocellus buff, this color weakening distad between A_2 and Cu_2 and in the cell. The pink subbasal line normal, its outer black band more intense than in normal individuals. Pink submarginal band distinct, but thin, its inner black band nearly lost in the black ground color. The two subapical black spots fused with the ground color. Ocellus normal. Marginal area warm ochre-clay color.

Secondaries, upperside: the black ground color extends from the subbasal band to the submarginal band, but does not include the cell nor the area behind the anal vein. The latter and the basal areas are buff. The black area is weaker than in the primaries, and very weak in the costal area. The veins stand out blacker than the ground color as described above in the primaries. The pink submarginal band somewhat narrower than normal, its inner black band being more distinct than in primaries. Ocellus and cell spot normal. Marginal area as in primaries.

Underside, primaries: the dark area is not so intensely black as on the upper side, and extends from the subbasal band to the second submarginal band, and also includes the cell. Inner marginal area pale. Costal area narrowly blackish. Veins with buff scaling, causing them to show distinctly on the blackish ground color. Submarginal band blackish, more distinct than in normal individuals. Ocellus normal, its black outer ring lost in the ground color. Marginal area brownish-buff.

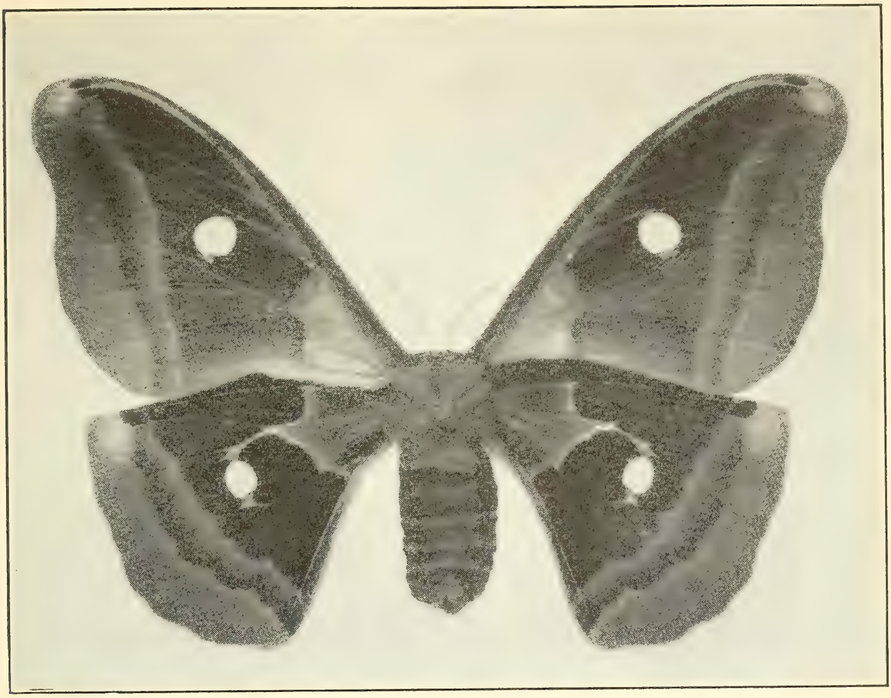
> Secondaries, underside: the blackish area as in primaries, but more intense. Costal area black. Area behind anal vein blackish. Basal area brownish, due to a dusting of black scales. Veins less distinct than in primaries. Ocellus, marginal band, and marginal area as in primaries.
>
> Thorax and abdomen above buff. Collar black, narrowly interrupted on the dorsal line with buff hairs. Thorax below, about normal. Abdomen blackish, sutures outlined with buff hairs, terminal segment buff.

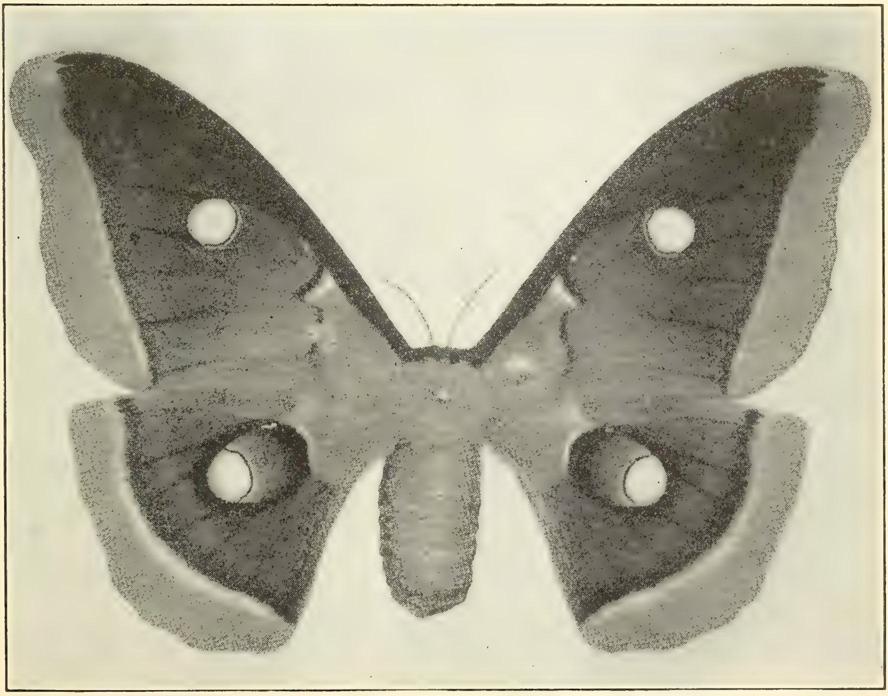
Holotype: One female from central western United States, in author's collection. Emerged March 22, 1930.

This is but the second or third melanic *polyphemus* of which I have knowledge. Dr. W. J. Holland, in his " Moth Book," page 89, makes the following statement: " I have one or two fine melanic specimens, in which the wings are almost wholly black on the upper side." As this aberration is apparently without a name, the above, *fumosus,* is proposed.

This species, as is well known, is exceedingly variable, the ground color being various shades of tan, yellow and gray. However, the characteristic light gray stripes along the costa and the collar are always present, but in *fumosus* they are of the deepest black.

This beautiful female emerged from a large consignment of cocoons received from the central west. It is to be hoped that it will be placed eventually in one of our large museums, where those who appreciate a radical deviation from the normal, may be able to study it, and where it will be accessible to future students.





NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARTIC REGION (TIPULIDAE, DIPTERA).

PART II.

By Charles P. Alexander, Amherst, Mass.*

The new species described at the present time were included in material sent to me for identification by Miss Helen E. Sweet, taken at and near Claremont, California, and discussed in detail in her study on *Artemisia* and its ecological relationships (Journal of Entomology and Zoology, Pomona College, 1930); in a large and important collection of crane-flies taken in the highest mountains of Colorado by Mr. Charles F. Clagg; and in a small but highly interesting series of Tipulidae sent to me by Mr. Charles W. Johnson. The types of the species, with the exception of *Oropeza johnsonella*, are preserved in the author's collection.

Mr. Fred W. Edwards, of the British Museum of Natural History, has made a critical study of the hitherto unrecognizable species of Nearctic *Tipula* described by Francis Walker in 1848 and 1856 and as a result the identity and synonymy of almost all of these species has been settled. This study has resulted in the changing of name of several of our best-known species of the genus. I am very deeply indebted to Mr. Edwards for the opportunity of publishing these changes of names at this time. In the following list, the earliest name is the correct one in all instances:

albilatus Walker (1848) = *abdominalis* (Say) (1823).
borealis Walker (1848) = *hebes* Loew (1863).
disjuncta Walker (1856) = *taughannock* Alexander (1915).
dorsimacula Walker (1848) = *angustipennis* Loew (1863).
duplex Walker (1848) = *cincticornis* Doane (1901),
    mingwe Alexander (1915).
furca Walker (1848) = *bella* Loew (1863).
glomerata Walker (1848) = *arctica* Curtis (1831).
platymera Walker (1856) = *tesselata* Loew (1863),
    labradorica Alexander (1915).

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* Contribution from the Entomological Laboratory, Massachusetts Agricultural College.

simulata Walker (1856) = *trivittata* Say (1823).
triplex Walker (1848) = *inermis* Doane (1901),
(?*umbrosa* Loew, 1863).

In addition to the above, *Tipula resurgens* Walker (1848) is almost certainly *T. latipennis* Loew (1864).

Tipula jacobus n. n.

In 1848, Walker described *Tipula filipes* as new. In 1909, Johnson identified *filipes* as being one of the larger and commoner species in Eastern North America and the name being preoccupied by *Tipula filipes* Fabricius (1805), he renamed the species *Tipula perlongipes.* Mr. Edwards now informs me that the crane-fly described by Walker and renamed by Johnson is an entirely different species from the Eastern American species that has been passing under the name of *perlongipes.* I therefore name this well-known fly as above, the species being dedicated to my friend and co-worker, Professor James Speed Rogers. The present species has been earlier discussed and figured (Alexander, Crane-flies of New York, I, p. 952, fig. 268; 1919).

Tipula mesotergata n. sp.

General coloration reddish brown, gray pruinose; male hypopygium of moderate size; ninth tergite large, the lateral angles produced caudad into short broad bispinous plates; caudal margin of tergite between the lateral lobes nearly transverse; eighth sternite with the lateral lobes low.

Male.—Length about 16 mm.; wing 14.5 mm.

Frontal prolongation of head long, yellow; nasus small; palpi with the basal segment yellow, the remainder passing into dark brown. Antennae with the scape yellow; flagellum broken. Head reddish brown, dusted with gray; a narrow median brown vitta on anterior portion of vertex.

Mesonotum reddish brown, with a gray pruinosity; median region of scutum behind the suture with a semicircular yellow area; postnotum yellowish gray. Pleura yellowish gray, the dorsopleural region more yellowish. Halteres yellow, the knobs infuscated. Legs with the coxae yellowish gray; trochanters yellow; femora yellow, the tips narrowly and vaguely darkened; terminal tarsal segments blackened. Wings yellowish gray, the base and costal region more yellowish; stigma yellowish brown; antestigmal obliterative areas narrow but extensive, extending from before the stigma, across cell *1st* M_2 into cell M_3.

Abdominal tergites yellow, with indications of three darker longitudinal stripes, the caudal margins of the segments narrowly yellow, becoming broader and more conspicuous on the subterminal segments; hypopygium of moderate size, reddish. Male hypopygium with the tergite large, the lateral angles produced caudad into short broad plates, the apices of which are obliquely truncated and unequally bispinous, the outer spine stouter; caudal margin of tergite between nearly transverse, the median portion elevated into two barely evident yellow tubercles. Basistyle entire, the dorsal portion greatly narrowed. Outer dististyle small and slender. Inner dististyle with the basal portion separated from the main body of the style by a deep notch, the apex of this slender basal portion terminating in two or three spinous points. Ninth sternite with a quadrate median notch. Eighth sternite with the caudal margin subtransverse to broadly and weakly emarginate, the lateral angles produced into low lobes that are directed mesad and caudad; on either side of the median line of the sternite a small brush of golden-yellow setae, these decussate across the midline.

Habitat: California.

Holotype: ♂, Claremont, on *Artemisia tridentata* (*H. E. Sweet*); Collector's No. 28.

Tipula mesotergata is apparently most closely related to *T. sternata* Doane, differing in the structure of the male hypopygium.

Tipula sweetæ n. sp.

Male.—Length about 13 mm.; wing 10–11 mm.

Female.—Length about 14 mm.; wing 11.5 mm.

Allied and generally similar to *Tipula californica* (Doane) (*Pachyrhina californica* Doane, 1908), differing very conspicuously in the structure of the male hypopygium.

Size smaller. First flagellar segment entirely black. Head, thorax, abdomen and wings almost exactly as in *californica*.

Male hypopygium with the tergite large, the caudal margin with a narrow U-shaped median notch, the lateral angles of each lobe further produced into an acute spine. Basistyle entire. Lower dististyle conspicuously hairy, the distal third narrowed into a spine. Eighth sternite produced medially into two lobes that are separated by a deep V-shaped median notch, the mesal edges of the lobes conspicuously fringed with long yellow setae. *T. californica* has the hypopygium conspicuously larger, the tergite with a very broad U-shaped notch, the lateral lobes thus formed blunt, on ventral margin before apex with a small black spinous point. Lower dististyle much longer, glabrous.

Habitat: California.

Holotype: ♂, Claremont, 1929 (*H. E. Sweet*); Collector's No. 42. *Allotopotype:* ♀, *Paratopotypes,* 4 ♂♂; Collector's No. 32.

I take great pleasure in naming this species in honor of the collector, Miss Helen E. Sweet.

Oropeza johnsonella n. sp.

Size small (wing, ♂, under 10 mm.); mesonotum reddish brown, the brown praescutal stripes relatively indistinct; halteres dusky; legs pale brown, the tarsi a little paler; male hypopygium with the inner dististyle a flattened blade, the apex subtruncate, on outer margin near base with a small setiferous tubercle; gonapophyses recurved, tipped with acute spines.

Male.—Length about 8 mm.; wing 9.8 mm.

Frontal prolongation of head and palpi dark brown. Antennae (♂) relatively elongate, if bent backward extending to beyond the base of abdomen; scape honey-yellow; first flagellar segment short, the remaining segments passing into brown. Head dark brown.

Mesonotum reddish brown, the praescutum with three indistinct darker brown stripes. Pleura light brown, with vaguely indicated darker areas on anepisternum, ventral sternopleurite and ventral pleurotergite. Halteres dusky, the base of stem yellow. Legs with the coxae yellow, infuscated at base; trochanters yellow; a single (posterior) leg remains, pale brown, the tarsi a trifle paler, more yellowish brown. Wings tinged with brown, the stigma darker brown; veins brown. Venation: Cell M_1 about one-half longer than its petiole.

Abdominal segments ringed with brown and yellow, the apices of the segments paler than the bases. Male hypopygium with the lateral portions of the tergite produced into conspicuous setiferous shoulders, the intermediate margin very gently crenulate; ventro-lateral arms of tergite strongly curved, slender, not expanded outwardly, the apex acute or subacute. Outer dististyle a little longer than the inner dististyle, cylindrical, not dilated at base. Inner dististyle a flattened blade, near base on outer margin with a small tubercle set with conspicuous setae; apex of style subtruncate. Gonapophyses recurved, setiferous, the tips set with several acute spines.

Habitat: Eastern North America.

Holotype: ♂, Riverton, New Jersey, August, 1911 (*C. W. Johnson*). Type returned to Mr. Johnson.

This interesting *Oropeza* is named in honor of Mr. C. W. Johnson, distinguished authority on the American species of the genus. In its small size and general appearance, *Oropeza johnsonella* agrees most closely with *O. rogersi* Alexander, differing in the structure of the male hypopygium, especially the inner dististyle, which bears a setiferous tubercle on outer margin beyond base. This type of structure is found in the Nearctic species only in *O. subalbipes* Johnson, an otherwise very different fly.

Cylindrotoma pallescens n. sp.

General coloration pale yellow, the usual black areas entirely replaced by very pale rufous, scarcely evident against the ground-color; antennae pale yellow.

Female.—Length 11 mm.; wing 10 mm.

Antennae pale yellow, the terminal segment darkened; flagellar segments a little shorter than in *splendens.* Head brownish gray, more yellowish behind.

Thorax pale yellow, the very pale rufous areas scarcely indicated against the ground-color. Halteres pale yellow. Legs pale yellow, the femoral tips a little darkened; last tarsal segment darkened. Wings yellow, stigma barely evident; veins pale brown, those in the prearcular and costal regions clearer yellow. Venation: *Rs* relatively short, about one-fifth longer than R_3, arcuated at origin; *m* at fork of M_{1+2} or beyond on M_2.

Abdomen yellow.

Habitat: Colorado.

Holotype: ♀, Ute Pass, Williams Fork Range, Grand Co., altitude 10,500 feet, July 16, 1929 (*C. F. Clagg*).

Cylindrotoma pallescens is apparently most closely allied to *C. splendens* Doane, being distinguished by the almost uniformly pale yellow coloration, the dark areas being replaced by very pale rufous. The wings are fully colored and the fly is apparently not a teneral individual. The left wing of the type shows a weak trace of an adventitious crossvein in cell R_5, in alignment with *m,* thus suggesting the condition found in *Cyttaromyia.*

Tricyphona claggi n. sp.

Belongs to the *diaphana* group; general coloration gray, the praescutum with four brown stripes; antennae 12-segmented; wings cream-colored, with a restricted brown pattern; cell M_1 lacking; cell *1st* M_2 closed.

Male.—Length about 7 mm.; wing 7.5 mm.

Rostrum gray; palpi brownish black. Antennae 12-segmented, black throughout; flagellar segments nearly globular, gradually decreasing in size outwardly, the terminal segment smallest. Head light gray.

Pronotum gray, the anterior notum infuscated. Mesonotal praescutum light gray, with four conspicuous brown stripes, the intermediate pair ending some distance before the suture; lateral stripes narrower, reaching the suture; scutum gray, the lobes with barely indicated dark markings; posterior sclerites of mesonotum gray, the parascutella darker. Pleura gray. Halteres pale, the knobs infuscated. Legs with the coxae pruinose; trochanters obscure yellow; femora obscure yellow, passing into brown at tips; tibiae and tarsi dark brown, the outer segments of the latter blackened. Wings cream-colored, with a restricted brown pattern, including a cloud at origin of *Rs,* the stigma and anterior cord, narrower seams on posterior cord and outer end of cell *1st* M_2; radial field beyond cord vaguely suffused with brown; veins much darker than the ground-color, especially those beyond the cord. Venation: R_{4+5} distinct; cell M_1 lacking; cell *1st* M_2 closed; *m-cu* just before midlength of cell *1st* M_2.

Abdomen gray, the hypopygium somewhat brighter. Male hypopygium with the lateral appendages of the tergite appearing as conspicuous curved flattened blades, the tips acute. Interbasal spines about one-half the length, slender, strongly curved.

Habitat: Colorado.

Holotype: ♂, Bobtail Creek, Grand Co., altitude 11,000 feet, July 20, 1929 (*C. F. Clagg*).

Tricyphona claggi is named in honor of the collector, Mr. Charles F. Clagg, to whom I am greatly indebted for numerous crane-flies from Colorado and the Philippines. The species is obviously allied to *T. diaphana* (Doane), *T. frigida* Alexander, and *T. exoloma* (Doane), differing conspicuously from all allied forms by the lack of cell M_1 of the wings.

Limnophila claggi n. sp.

Coloration of mesonotal praescutum and scutal lobes polished black; antennae of male elongate; thoracic pleura heavily pruinose; male hypopygium with the outer dististyle slender, the apex bidentate.

Male.—Length about 6 mm.; wing 6.2 mm.

Rostrum and palpi black. Antennae (♂) black throughout, elongate, if bent backward extending about to the base of abdomen; intermediate flagellar segments with the ventral face protuberant; flagellar segments gradually decreasing in size outwardly, the last segment small. Head black, pruinose.

Interspaces of mesonotal praescutum and the scutal lobes polished black, the lateral margins of the former and median area of the latter pruinose; remainder of mesonotum black, sparsely pruinose. Pleura black, heavily pruinose. Halteres pale yellow. Legs with the coxae gray pruinose; trochanters black; femora yellow, the tips blackened, most extensive on the fore legs where a little more than the outer third is included, narrower on the middle and hind femora; tibiae brownish black; tarsi black. Wings whitish subhyaline, the base and costal region more yellowish; stigma oval, pale brown; vague brown clouds along vein *Cu* and the cord; veins brown. Venation: Sc_1 ending just before the fork of *Rs*, Sc_2 at its tip; *Rs* angulated at origin; veins R_3 and R_4 strongly divergent, cell R_3 at margin wider than cell R_4; cell M_1 about twice its petiole; *m-cu* at midlength of cell *1st* M_2.

Abdomen black, pruinose; hypopygium black. Male hypopygium with the outer dististyle a slender blackened rod, the base wider, the apex bidentate, the lower tooth slightly larger. Gonapophyses appearing as large flattened plates, the margin with conspicuous appressed teeth. Aedeagus elongate.

Habitat: Colorado.

Holotype: ♂, Bobtail Creek, Grand Co., altitude 11,000 feet, July 20, 1929 (*C. F. Clagg*). *Paratopotype:* ♂.

Limnophila claggi is dedicated to the collector of the type material, Mr. Charles F. Clagg. The species differs from the small polished black species resembling *munda* Osten Sacken by the elongate antennae of the male and the structure of the hypopygium. The fly is doubtfully referable to the subgenus *Prionolabis* Osten Sacken.

NEW ROBBER FLIES FROM MADAGASCAR.
(Diptera, Asilidae.)

By S. W. Bromley, M.Sc., Bartlett Tree Research Laboratories, Stamford, Conn.

The following new species were in a collection obtained from Prof. Charles Lamberton, Academie Malgache, Tananarive, Madagascar.

The types of the species described are in the writer's collection.

DASYPOGONINAE.

Microstylum Macquart.

This genus is abundant in Madagascar and in the material at hand were discovered 5 new species.

Microstylum cinctum n. sp.

Length, 34 to 44 mm. (exclusive of the rostrum which is 3.5 to 5 mm. in length). A large, handsome species with the wings extending nearly to or in some cases surpassing the length of the abdomen. The species is largely black with a band of yellow pile near the base of the abdomen. The femora black and the tarsi and tibiae reddish.

Female. Antennae, palpi, rostrum and eyes black. Mystax composed of golden yellow bristles confined to the oral margin with a few small, fine, black hairs intermingled. Palpal hairs reddish gold toward the tip, yellowish at the base. A few black hairs intermingled towards the tip of the palpi. Hairs on antennae and vertex black, on occiput golden. Beard thick, golden yellow. Face golden pruinose. Thorax black with a brownish bloom. Hairs on pronotum and anterior portion of thorax blackish. On the posterior portion of the mesonotum, these are intermingled with fine, golden hairs. Scutellum with fine golden hairs and bristles. Coxae with long golden pile. The posterior coxa with a few black hairs. Hairs in front of the wings black; under wings golden. Wings dark brown with a purplish tinge. Halteres pale yellowish brown. Femora black with black hairs. A few yellowish brown bristles on the posterior femora. Tibiae reddish with reddish gold hairs and bristles. The anterior tibia is darker on the inner distal portion. The middle tibia has several stout, reddish spines at the ventral apex, but no enlarged tubercle. The tarsi are reddish with reddish bristles.

The ungues are black at the tips, reddish at the base. The pulvilli are pale brownish yellow. The abdomen is black with a light pollinose band around the middle of the second segment. This band bears long, golden pile. Similar colored pile occurs in lesser quantities on the first segment; the first four segments are velvety black, having very fine short, dark hairs; the succeeding segments are black, shiny. The ovipositor is black with black bristles and fine black hairs.

Holotype.—♀, Tananarive, Madagascar. 4 *Paratopotypes.* ♀♀.

Microstylum lambertoni n. sp.

Length, 40 to 47 mm. (exclusive of the rostrum which is 4 mm. in length). A large, black species with the thorax and a large part of the abdomen covered with a grayish "bloom" and fine, grayish yellow pile. The beard is golden, the wings almost hyaline with a black costal border. The femora and most of the tibiae reddish; the tarsi and tips of the tibiae black.

Female. Eyes, palpi, rostrum black. The antennae are broken, but the first two segments which remain are black with blackish bristles. The face is silvery pruinose. The hairs on the vertex are black. The occiput is thickly beset with pale golden hairs. The beard is thick and composed of similarly colored hairs. The palpal hairs are mostly black with some pale hairs intermingled. The mystax is composed of black bristles and white bristles. In one specimen the black predominates; in the other white. Thorax black with a bluish gray bloom. Hairs on lateral portion of the cervical region thick golden. Coxae with long, white pile. Fine hairs of mesonotum black, with longer yellow ones on the posterior portion and on the scutellum. Wings very light brownish, nearly hyaline, with the costal border blackish. Halteres dark brown. Femora reddish with short, fine, black and whitish or yellowish hairs intermingled. Tibiae reddish, darker, almost black, toward the extreme tip, thickly set with black hairs and bristles. The tibiae are slightly enlarged towards the tip, and the hairs become more thickly set in the distal portion also. The ventral apex of the middle tibiae bears several stout spurs, but there is no enlarged tubercle. The tarsi are large and broad, thickly covered with black hairs and bristles. The ungues are black and the pulvilli yellowish. The abdomen is black. The first four segments covered with a thin, grayish bloom, while the remainder are shining black. The lateral anterior portions of the third and fourth segments are shiny black also. The venter of the abdomen bears fine pile out to the very tip, while the sides of the first two and the dorsum of a band on the second bears quite thick, white pile. The ovipositor is shining black with black bristles.

Holotype.—♀, Tananarive, Madagascar. 1 *Paratopotype.* ♀.

Microstylum lucifer n. sp.

Length 33 mm. (exclusive of the rostrum which is 6 mm. in length). A slender, black species with two reddish lines on the dorsum of the thorax, an extremely long, black rostrum, and the face, vertex and occiput, golden pruinose. The wings black with a yellowish area medio-basally.

Female. Rostrum, eyes, palpi, antennae black. Base of palpi somewhat yellowish. Face, vertex and sides of occiput golden. The upper portion of the occiput back of the upper portion of each eye without this bloom, giving the appearance of two black spots. Vestiture of head black. Thorax black, vestiture black. On each side of the mesonotum is a reddish line, extending from the humeral callus backward to three-fourths the length of the mesonotum. There is a reddish spot in the humeral callus and dorsally at the base of the wing is another very pale area. The legs are black with black bristles, the pulvilli yellowish brown, the middle tibiae bear three stout, black spines, ventrally at the apex. Halteres black; wings black with a yellowish area medio-basally. Abdomen black. First three segments dull black, the remainder shiny black. The ovipositor black with black spines.

Holotype.—♀, Tananarive, Madagascar.

Microstylum umbrosum n. sp.

Length, 25 to 32 mm. A black species with the mesonotum brownish pollinose. Four anterior tibiae and tarsi brownish and the wings yellowish brown in the male, whitish towards the base.

Male. Head and vestiture black. The third joints of the antennae are missing. Vertex and face deep bronze pruinose. Occiput reddish brown pruinose. Thorax deep black; vestiture black. Mesonotum brownish pruinose with two median lines where the pruinosity appears lighter. Femora black, the extreme tip of the anterior femora yellowish. The four anterior tibiae and tarsi yellowish with black bristles, and some fine yellowish hairs. The middle tibiae has a decided spur-like tubercle which bears two very short, black spurs.

The posterior tibiae and tarsi are reddish brown, with black hairs and bristles. The ungues are black, yellowish at the base, the pulvilli yellowish brown. Wings brown distally with brown veins, the basal half whitish. Halteres pale yellowish brown. Abdomen black. Third and fourth segments brownish pollinose, remaining segments shiny black. Genitalia black with blackish and pale reddish hairs intermingled.

Female. Similar, but the tarsi and tibiae more reddish. The mesonotum is more broadly brownish pruinose with a mid-dorsal blackish line. The wings are light reddish, brown, becoming darker towards the tips. The abdomen is black. The first three segments blackish pollinose and the remainder shiny black. The sixth and seventh especially shining, and the eighth segment is deep reddish with reddish and black hairs intermingled. The spines on the ovipositor piceous.

Holotype.—♂, Tananarive, Madagascar. *Allotopotype* ♀. *Paratopotype* 5 ♀♀.

Microstylum tananarivensis n. sp.

Length, 25 to 31 mm. (exclusive of rostrum, which is 2.5 mm. in length). A slender, reddish species with abdomen extending beyond the wings when folded, the thorax with three broad dark lines, the median divided by a narrow, light-colored line, and the legs reddish yellow with darker lines on the anterior portions of the femora and tibiae.

Male. Rostrum black above, reddish beneath. All vestiture of the head pale yellow, that of the vertex with a more reddish tint. Occiput, vertex and face pale yellow pruinose. Palpi reddish-yellow. Antennae reddish-yellow, third segment darkest. Vestiture of thorax and coxae yellowish, the bristles on the posterior portion of mesonotum and on scutellum pale reddish. Pleura pale yellow pruinose. Dorsum pale reddish-yellow pruinose. Three broad black lines on disc of mesonotum, the median divided into two by a very thin, pale yellow line. Wings light brown; halteres yellowish-brown. Legs light reddish-yellow with concolorous hairs and bristles. The front and middle femora have a blackish line on the anterior portion. The posterior femora is darker distally. Ungues black with bases reddish-yellow. Pulvilli reddish-yellow. Abdomen reddish-yellow with minute, concolorous hairs. A few bristles on the sides of the first segment, the same color. The anterior portion of the first segment is darker, nearly black. The genitalia from about the same width as the seventh segment, reddish with lighter hairs.

Female. Differs in the following respects: wings are lighter; the posterior femora has a dark anterior line similar to that on the first and second, while all the tibiae are darker on the anterior portion, and the abdomen bears blackish spots along the sides. The ovipositor is reddish dorsally, black laterally, spines reddish-brown.

Holotype.—♂, Tananarive. *Allotopotype* ♀. *Paratopotypes* 4 ♂♂; 9 ♀♀.

LAPHRIINAE.

Laphria Meigen.

One species is placed here on the basis of the venation and the structure of the palpi and the ovipositor. The species approaches both *Andrenosoma* Rondani and *Nusa* Walker (*Dasythrix* Loew) in that the thoracic markings resemble those of the first, while the habitus in general is suggestive of the latter. The proboscis is not truncate as in typical *Laphria,* but is slightly pointed in profile as in *Andrenosoma,* not, however, upturned at the tip as is common in that genus. On the contrary, it is very slightly downturned as in *Nusa.* Not wishing to propose a new genus until a further study of relationships may be made, I have referred it to the common repository for species of this sub-family—the genus *Laphria.*

Laphria nusoides n. sp.

Length, 11 to 18 mm. A dark, metallic blue species with coxae and lower pleura whitish pruinose; wings nearly hyaline, smoky at the tips; face and spots on mesonotum yellowish-brown pruinose.

Male. Head black. Antennal bristles, those of vertex, occiput and mystax black. Face and bristles below antennae and those on upper portions of mystax golden. Beard, palpal hairs and some of the bristles of the mystax near the base of the palpi nearly white. Antennae black, the third segment somewhat longer than the first two together. Thorax blue-black. Mesonotum with two small, pale yellow, pruinose spots on the wing and the posterior margin with a golden-brown line. Hairs on dorsum, fine, black. Scutellum blue-black with black hairs and four or five black bristles on margin directed backwards. Wings hyaline, smoky towards tips, the first posterior cell open. Halteres pale brown. Legs blue-black with whitish hairs and a few black bristles. Abdomen blue-black, linear, gradually pointed toward tip. Genitalia from above narrower than seventh segment; very suggestive of *Andrenosoma.* The posterior lateral margins of the abdominal segments bear small whitish pruinose spots. There is a small amount of fine white, scattered pile along the sides. Genitalia blue-black with black hairs, a few fine white hairs toward the tip.

Female. Similar. Ovipositor short as in *Laphria.* Black hairs at tip.

Holotype.—♂, Tananarive. *Allotopotype* ♀. *Paratopotypes* 2 ♂♂.

ASILINAE.

Promachus Loew.

Promachus lemur n. sp.

Length, 25 to 29 mm. A black species with black legs; the thorax pale grayish-yellow pruinose with a broad velvety black median line, widening anteriorly, and two large spots on each side, on the mesonotum. There is an area of long, pale pile on the sides of the first three abdominal segments.

Male. Rostrum, palpi, antennae (third segment missing), hairs of vertex, occiput, antennae, palpi and upper portion of mystax black. Face and occiput, pale yellow-gray pollinose. Beard and most of mystax pale yellowish, mystax more golden. Thorax black with markings as described above. Hairs and bristles of dorsum black. A tuft of golden hairs below and in back of base of wings and a patch of black bristles below this tuft. Wings light brown; a large dark shadow in the first submarginal cell. Halteres pale yellowish-brown. Scutellum yellowish pruinose with pale, yellow, upturned hairs and a few black bristles at margin. Front coxae with yellowish bristles, second with black and yellow intermingled and third with mostly black. Legs black, with scattered yellowish hairs and black bristles. Ungues black, pulvilli yellowish. First four segments of front tarsi with short, thick silvery pile above. Abdomen black with a tuft of black bristles on the sides of the first segment. There is a patch of long whitish pile on the sides of the first three segments. Genitalia rather small and narrow for a *Promachus,* black with black hairs.

Female. Similar in coloration, but lacking the silvery hairs on the front tarsi. Segments six to eight laterally compressed to form the ovipositor.

Holotype.—♂, Tananarive. *Allotopotype* ♀. *Paratopotype* ♀.

Promachus clavigerus n. sp.

Length, 28 to 31 mm. A whitish pruinose species with hyaline wings. A faint shadow in the first sub-marginal cell.

The legs with femora black and tibiae reddish with short, fine, whitish pubescence. The genitalia broader than any segment of the abdomen, except the first.

Male. Antennae black with fine, black bristles. Palpi black with black hairs at tip, whitish at base. A few bristles on the occiput blackish; rest of head thickly covered with fine, pale hair. The beard whitish, the hairs of the mystax with a pale yellowish tint. Thorax whitish pollinose on sides, pale yellowish pollinose above. Vestiture whitish, except the fine black hairs and some of the bristles on the dorsum black. Scutellum with whitish bristles and hairs. Two brownish median lines and two lateral spots of the same color on the mesonotum. Humeral callus reddish-brown. Legs covered with fine, white pubescence. Bristles black. Femora black with the posterior portion of the first and the base of the last reddish. Tibiae reddish, blackish towards the tips. Tarsi black with black bristles. The anterior thickly covered with fine, yellowish-white hairs above. Ungues black. Pulvilli pale yellowish-brown. Abdomen black, thickly, pale yellowish pruinose, except the seventh segment. Fine hairs along the sides and on the first segment whitish. The sixth and seventh segments bear black appressed hairs on the sides and there are similarly colored hairs at the extreme margin of the sides of the fifth segment, the seventh segment and genitalia velvety black with blackish hairs on the sides and basal portion of the latter, but the tips of the claspers with long, fine, thickly set, white pile.

Female. Female similar in color, except the middle femora bears a reddish line posteriorly. The abdomen long and slender, projecting a considerable distance beyond the wings; the ovipositor is only slightly compressed.

Holotype.—♂, Tananarive. *Allotopotype* ♀. *Paratopotype* ♂.

Promachus parvus n. sp.

Length, 17 to 21 mm. A small, pale brownish pollinose species with hyaline wings, slender, elongate abdomen and reddish legs.

Female. Vestiture of head whitish, except mystax which is pale straw-colored. A few bristles on the vertex, occiput are blackish and the palpal hairs are blackish. Antennae, proboscis, palpi black. Thorax pale brown pollinose above. Whitish pollinose on the sides. Mesonotum with a broad median line, and two lateral blackish spots on each side. Humeral callus reddish. Vestiture of thorax mostly white with a few fine black hairs and black bristles on the dorsum. Posterior calli reddish, but covered with a pale brownish pollen. Scutellum black, pale brownish pollinose. White bristles at the margin. Wings hyaline, a very faint shadow, merely a streak, in the sub-marginal cell. Halteres very pale brownish. Veins black, yellowish at their bases. Legs reddish with fine white pubescence, and black bristles. Tarsi black, middle femora black on the upper side. Posterior femora and tibiae blackish towards their tips. Ungues black. Pulvilli pale yellowish. Abdomen pale brownish pollinose with brownish dorsal triangular streaks and lateral spots on the second, third and fourth segments. The remaining segments narrower, blackish.

Holotype.—♀, Tananarive. *Paratopotype* 4 ♀♀.

Heligmoneura Bigot.

One species is referred to this genus.

Heligmoneura medianus n. sp.

Total length, 13 to 18 mm. A bare slender, pale yellowish, gray pollinose species with a broad velvety, black median line on the dorsum of the thorax, and three small black spots on each side.

Male. Antennae brownish, third segment, occipital bristles brownish. Mystax whitish with two or three darker bristles, thin, confined to the slight prominence on oral margin. Palpi very small, blackish with pale hairs. Head pale yellowish, white pollinose. Thorax pale yellowish pollinose above, white pollinose on sides. Posterior portion of mesonotum and margin of scutellum with a few black bristles, the latter with two. Coxae with white hairs. Mesonotum with broad black median line and three small blackish spots on each side. Wings hyaline, pale yellowish toward tips. Legs yellow with pale hairs and black bristles. Tarsi darker, a spot on the median upper portion of the femora, and the apices of the second and third femora and tibiae blackish. Ungues black, brownish at base. Abdomen black, pale brownish pollinose, posterior margins of the segments paler. Genitalia black, very slightly wider than seventh segment from above.

Female. Similar, ovipositor black, shorter than seventh segment, the oviduct slender resembling a short spine.

Holotype.—♂, Tananarive. *Allotopotype* ♀. *Paratopotypes* 4 ♂♂, 3 ♀♀.

DISTRIBUTION NOTES ON CULICIDAE (MOSQUITOES).

By Robert Matheson, Ithaca, N. Y.

During the summer of 1929 I had the opportunity of identifying some 2,300 specimens of Culicidae (except the Anophelini) from the museum of the Illinois State Natural History Survey. As the data on mosquitoes from Illinois is very meagre it seems wise to record some of the more interesting distribution notes. Furthermore, a few interesting species from various parts of the world were included and notes on some of these are also appended.

Chaoborinae.

Chaoborus albatus Johnson. 4 males from Clear Lake, Ind., July 17, 1914. The only other American records are by Johnson —Mt. Tom and Brookline, Mass.

Chaoborus punctipennis Say. Males and females, Grand Junction, Mich., July 15, 1914, and Cedar Lake, Ind., July 17, 1914. Females, Peoria, Ill., June 15 and Dubois, April 24, 1914.

Culicinae.

Culex apicalis Adams. There seem to be very few definite records of this common mosquito from Illinois. Males and females from White Heath, 1906; Carbondale, May 30 and July 3, 1919; Lake Villa, August 9, 1906; Vienna, August 16, 1905; Herrin, September 27, 1920, and Algonquin, May, June and August are in the collection.

Culex inhibitator Dyar and Knab. Dyar records this species as extending from the Mississippi Valley and the southern states south through Mexico and Central America to South America. He gives only one record from Illinois (Herrin). The museum collection contains males and females from Havana, August and September; Herrin, August 27 and July 20, 1925; Pike, June 25, 1906, and Algonquin, September 10, 1914. Very little seems to be known regarding the habits of this species. Coad took four females at Havana at night (August 6 and 15, 1911) while in the act of biting him.

Culex pipiens L. The distribution of this common house mosquito can only be definitely determined from an examination of the males and the larvae. (It is very difficult to separate the larva of this species from that of *Culex quinquefasciatus*). Males are recorded from Herrin, August; Carbondale, October, and Mt. Carmel, June. The Museum has also a long series of this species collected in a school in Seoul, Korea (October and November, 1918).

Culex quinquefasciatus Say (*fatigans* Wied.). Males of this species are recorded from Havana, July, September and October; Carbondale, May 30, 1919, and Forest Glen, October 2, 1915. There is a wide range of variation in the hypopygia of this and the preceding species. In a region where the two species occur there appears to be all sorts of gradations and the possibility of interbreeding is indicated.

Culex salinarius Coq., *Culex territans* Walker, and *Culex tarsalis* Coq. are widely distributed in Illinois.

Aedes campestris Dyar and Knab. The most eastern record of this species is Minnesota. Four females were taken by Davis along a railroad at Riverdale, Ill., on April 9, 1910.

Aedes cataphylla Dyar. This species, according to Dyar, is restricted to the Rocky Mountains, from Colorado north to the Yukon. In the collection there is one male taken at Mt. Carmel, Ill., on June 30, 1906. This would indicate a much wider range for the species than that given by Dyar.

Aedes excrucians Walker. There appears to be no records of this species from Illinois. I can record it from Ravinia, June 8, 1926; Glencoe, June 9, 1926; Urbana, October 29, 1926, and Algonquin, May and June.

Aedes fitchii Felt and Young. New records are Urbana, May 12, 1887 (one male); Algonquin, June (3 males).

Aedes flavescens Müller. The most eastern record for this species in the United States is Minnesota. In this collection there are 4 males and 3 females from Algonquin, Ill. (May and June).

Aedes hirsuteron Theobald. We have no records of this species from Illinois. The following are new: Urbana, May and June, 1906; Bishop, June 23, 1906; Prophetstown, July 19, 1927; East St. Louis, July 18, 1906; Ravinia, July 9, 1926; Homer, May 14, 1906; Pike, May 26, 1906; Golconda, April 18, 1914; Pulaski, April 21, 1909, and Havana, August and October, 1912.

Aedes sollicitans Walker. Dyar has always recorded this species from the coastal areas from Maine to Florida and the Gulf

Coast. I have a long series collected at Syracuse, N. Y. In the Illinois material there are 2 males and 3 females collected at Herrin, Ill., by Chandler on May 21, 1925. This species certainly occurs inland breeding in salt areas.

Aedes stimulans Walker. New records: Glencoe, June 9, 1926; Ravinia, June 8, 1926; Bishop, June 23, 1906; Muncie, June 13, 1906; Algonquin, May, 1905; River Forest, July 11, 1913; Northmoor Woods, June 9, 1926. (All records are from Illinois.)

Aedes triseriatus Say. This species is widespread throughout the state, being represented by 123 females. An interesting observation by Frison is worth recording. On June 30, 1927, while collecting at a light he captured 27 females in the act of biting.

Aedes vexans Meig. This is undoubtedly the most abundant and widespread species in the Illinois area. Out of 2,300 specimens 900 proved to be this species.

Aedes canadensis Theo. is quite widely distributed in Illinois. I can record it from Urbana, May and June; Mascoutah, July 17, 1906; Antioch, August 1, 1924; Danville, July 7, 1906; Golconda, April 18, 1914; Scott Field, May 10, 1918; Carbondale, May 4, 1918, and Thebes.

Aedes dorsalis Meig. is represented by only three females from Oak Park, May 22, 1909, and September 6, 1906.

Aedes trivittatus Coq. One female from Urbana, Ill., September 29, 1929. Mr. J. Lyell Clarke records this species as rather abundant and annoying around Ravinia Park, about twenty miles north of Chicago along the shores of Lake Michigan.

Aedes nearcticus Dyar. This species is recorded from the Arctic coast of the Canadian North West Territory, the Rocky Mountains south to Montana (Glacier National Park). In the Illinois collection are four perfect males taken at Cranbrook, B. C., on May 5, 1921. I have also one male taken at Alamosa, Colorado, by S. C. Bishop on June 17, 1930.

Aedes japonicus Theo. In the Museum collection there are 6 females and 5 males of this species collected at Seoul, Korea, on October 18 and November 4, 1915. Edwards (Bull. Ent. Res., 7, p. 212, 1917) described *Aedes koreicus* from a male and a female collected in Korea. He states that this species is closely allied to *A. japonicus* Theo., differing only in that the last two hind tarsal joints are ringed with white. In the material before me there are specimens with all the hind tarsal joints showing white rings (the last one very faint), and the last joint without any white. The markings of the other legs agree with Edwards' description of *A. koreicus.* As basal white bands on the tarsi are rather variable, even in reared specimens of the same species, it would seem inadvisable to maintain *A. koreicus* as a distinct species or even as a variety.

Theobaldia impatiens Walker. In this collection there are several records of interest: 1 female from Lake Delavan, Wis., collected on a hotel porch on April 7, 1892; 2 females from Minoccus, Wis., August, 1929; 1 male from Carbondale, Ill., October 3, 1918; one female from Arrowhead Lake, B. C., Canada.

Theobaldia inornata Williston. This species appears to be common and widespread in Illinois. The following records may be noted: Muncie, June 8, 1916; Havana, April 3 and October 2; Algonquin, April, May, June and October 27, 1903; Urbana, September 29, 1928; Makanda, April 16, 1927; Carbondale, September 1, 1918.

Psorophora columbiae Dyar and Knab. Males and females are recorded from Grand Tower, July, 1906; Oak Park, July 28, 1900, and Carbondale, October 15, 1918.

Psorophora ciliata Fabr. Only a single female taken by Frison at light at Homer Park on July 6, 1927, is in the collection.

Psorophora posticata Wied. This species can be recorded from White Heath, April 7, 1915; Mascoutah, July 17, 1906; East St. Louis, July 18, 1906, and Havana, September 18, 1895. (All records from Illinois.)

Orthopodomyia signifer Coq. One male and one female collected at Urbana, Ill., on September 2 and July 31, 1916.

Mansonia (*Taeniorhynchus*) *perturbans* Walker. This species may be recorded from Roxana, June 20, 1927; Danville, July 7, 1906, and Algonquin, June and July. These are the first known records from Illinois. There were 27 specimens in the collection.

Uranotaenia sapphirina O. S. One female from Herrin, Ill., August 26, 1920.

FOUR NEW SPECIES OF MIRIDAE FROM TEXAS (HEMIPTERA).*

By H. G. Johnston, Ames, Iowa.

Phytocoris conspicuus n. sp.

This species is readily distinguished from other related species by its conspicuous red markings and male genital claspers.

♀. Length 5.58 mm., width 1.93 mm. Head: width .96 mm., vertex .37 mm., clothed with silvery simple hairs and sericeous pubescence; yellow, frons marked with bright red oblique lines; tylus yellow, apical third bright red, basal two-thirds with irregular red lines; juga and lora more red than yellow. In one dark specimen the head becomes uniformly dark reddish brown, the oblique lines on frons nearly obsolete. Rostrum, length 2.31 mm., reaching upon third ventral segment, yellowish, apical segment brownish to black. Antennae: segment I, length 1.21 mm., red, broad pale band anterior to middle, clothed with many pale yellowish bristles which in length are equal to more than thickness of segment; II, 2.2 mm., reddish brown, with broad pale band at base, a broader pale band anterior to middle but sometimes obscure; III, 1.5 mm., fuscous, pale at base; IV, 1.13 mm., uniformly fuscous. Pronotum: length .92 mm., width at base 1.59 mm.

Dorsum clothed with simple brownish pubescence and intermixed with white sericeous pubescence, the latter more abundant on mesoscutum, base of scutellum, transverse band across middle of hemelytra and a rounded patch near apex of corium. Dorsum yellowish and darkened with fuscous; pronotal disk slightly fuscous, an irregular darker area extending along lateral margins posterior to calli and across posterior margin, interrupted by pale areas near humeral angles and on middle of posterior margin; calli and collar uniformly yellow. Scutellum uniformly yellow, a dusky to fuscous point on each margin near apex; mesoscutum becoming fuscous in dark specimens. Hemelytra yellowish, clavus, inner margin of corium and obscure transverse band near apex fuscous, base of cuneus reddish yellow, apex with red extending along both margins nearly to base. In darker specimens the apex becomes reddish brown and the base yellowish brown. Membrane dark fuscous, conspurcate with irregular white spots, a white angular spot on margin at apex of cuneus and a second somewhat smaller one about middle of lateral margin; veins fuscous, pale around apices of areoles. Ventral surface uniformly yellow; legs yellow, apical half of femora red, marked with irregular yellow spots; tibiae pale, annulate with broad unequal red bands; tarsi pale, base and apex fuscous. In darker specimens the red on the legs becomes reddish brown.

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* Contribution from the Zoology and Entomology Department, Iowa State College, Ames, Iowa.

♂. Length 5.46 mm., width 1.76 mm. Head: width .96 mm., vertex .33 mm. Rostrum, length 2.18 mm., reaching upon the fourth ventral segment, reddish brown, apical segment black. Antennae: segment I, length 1.15 mm., color and pubescence as in female; II, 2.12 mm., pale brownish, pale bands, as in female, obscure; III, 1.38 mm., fuscous, pale at base; IV, 1.09 mm., uniformly fuscous. Pronotum: length .84 mm., width at base 1.55 mm., coloration and pubescence similar to female; pronotal disk fuscous, collar, calli, line along middle and irregular line on posterior margin pale. Genital claspers distinctive as shown by drawing. (Fig. 1.)

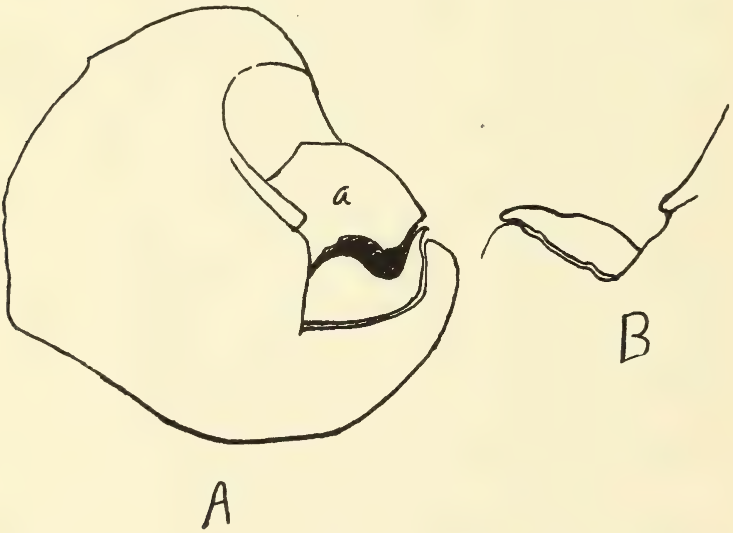

Fig. 1. **Phytocoris conspicuus** n. sp. A, left postero-lateral view of genital segment showing left clasper and flattened tubercle *a*; B, right postero-lateral view showing right clasper and outline of inner margin of genital segment.

Holotype: ♀, October 12, 1928, College Station, Texas (S. E. Jones); author's collection.

Allotype: ♂, October 6, 1928, College Station, Texas (S. E. Jones).

Paratypes: 2 ♀, October 5, 2 ♀ October 6, October 12, 1928, topotypic (S. E. Jones). All the specimens were taken at a light trap. ♂, 5 ♀, "Colo." (C. F. Baker); U. S. National Museum collection.

Three of the paratypes are in Dr. H. H. Knight's collection, five of them in U. S. N. M. collection and the others in the author's collection.

Eustictus knighti n. sp.

Closely allied to *albocuneatus* Knight, but differs in being larger, having longer membrane, and cuneus and antennal segment I being devoid of long erect hairs.

♂. Length 6.7 mm., width 2.35 mm. Head: width 1.3 mm.; vertex .21 mm., reddish brown; frons black. Rostrum: length .31 mm., reaching slightly beyond posterior margins of hind coxae. Antennae: segment I, length .96 mm., reddish brown, marked with pale, irregular transverse bands, sparsely covered with very short, fine, pale pubescence; II, 2.64 mm., densely covered with very short, fine, pale pubescence, the pale markings as in I, but somewhat obscure except in dark colored specimens; III, 1.38 mm., markings and pubescence as in II; IV, 1.13 mm., reddish brown, pubescence less dense than on other segments. Pronotum: length 1.21 mm., width at base 2.05 mm., black, the basal third often dark reddish brown, very narrow white line extending across basal margin.

Dorsum with many rather uniformly spaced, long, erect hairs on pronotum, scutellum, and hemelytra excepting cuneus and embolium. Ground color reddish yellow to brownish, head, except vertex, pronotum, scutellum, and inner apical area of corium, dark brownish to black, apical fourth of embolium reddish brown, its extreme edge black, basal half of cuneus opaque white, apex dark brown. Legs red, apex of femora and tibiae dark reddish brown. Venter uniformly red except genital segment which is reddish brown. Hind tibiae covered with very long erect hairs, also a few long erect hairs on apex of hind femora.

♀. Length 7.1 mm., width 2.6 mm. Head: width 1.26 mm., vertex .42 mm. Antennae: segment I, length 1.13 mm.; II, 2.89 mm.; III, 1.51 mm.; IV, 1.13 mm. Pronotum: length

1.34 mm., width at base 2.26 mm. Slightly larger but otherwise very similar to the male.

Holotype: ♂, May 9, 1929, College Station, Texas (H. G. Johnston); author's collection.

Allotype: ♀, May 22, 1930, College Station, Texas (H. G. Johnston).

Paratypes: 10 ♂♀, taken with the holotype. 3 ♂, taken with allotype. ♀, October 6; ♂, October 7; ♂, October 21, 1928, topotypic (S. E. Jones). ♂, May 16, 1929; 2 ♂, May 7, 1930, topotypic (H. G. Johnston). All the specimens were taken at light traps. ♀, Texas (Belfrage); U. S. N. M. collection.

This beautiful species is named in honor of Dr. H. H. Knight, who has so willingly given his time to make possible the correct determination of the author's collection of Miridae.

Labopidea geminata n. sp.

Allied to *planifrons* Knight, but readily distinguished by longer antennal segments II and III, narrower vertex, longer and more erect pubescence, and in the pale yellowish green color; male genitalia distinctive.

♂. Length 3.9 mm., width 1.17 mm. Head: width .79 mm., vertex .44 mm.; vertex and frons distinctly elevated, not as flat as in *planifrons*. Rostrum, length .71 mm., reaching well beyond the hind margins of front coxae. Antennae: segment I, length .31 mm.; II, 1.13 mm.; III, 1 mm.; IV, .42 mm., very slender; segments I and II uniformly pale yellowish, covered with conspicuous, brownish hairs, segments III and IV uniformly brown. Pronotum: length .37 mm., width at base .92 mm.; disk distinctly elevated.

Color pale yellowish green, head, pronotum, scutellum and venter paler; membrane uniformly dusky brown. Clothed with simple erect pubescence which is longer and coarser than in *planifrons*. Male claspers distinctive, similar to those of *planifrons*, but the lower margin of left clasper forming a rather broadly curved hook (not tightly compressed as in *planifrons*), the extreme tip reaching back to a point almost opposite the middle of clasper; right clasper more slender than in *planifrons*, the distal margin forming an acuminate spine which curves downward. Aedeagus very short, scarcely extending beyond posterior margin of left clasper.

♀ (Macropterous). Length 3.52 mm., width 1.33 mm. Head: width .79 mm., vertex .48 mm. Rostrum, length .71

mm., reaching beyond posterior margins of front coxae. Antennae: segment I, length .29 mm.; II, .92 mm.; III, .79 mm.; IV, .42 mm. Pronotum: length .37 mm., width at base .96 mm. Shorter and broader than male but otherwise very similar.

♀ (Brachypterous). Length 3.15 mm., width 1.34 mm. Head: width .84 mm., vertex .52 mm. Rostrum, length .79 mm. Antennae: segment I, length .29 mm.; II, .96 mm.; III, .84 mm.; IV, .42 mm. Pronotum: length .37 mm., width at base .94 mm. Coloration and pubescence as in macropterous form; form somewhat shorter and broader; hemelytra covering a little more than half the abdomen, completely developed excepting membrane which is practically absent, the cuneus round at apex. This form occurs much more abundantly than the macropterous form.

Holotype: ♂, April 4, 1928, Huntsville, Texas (H. G. Johnston); author's collection.

Allotype: ♀, taken with the holotype.

Morphotype: ♀, taken with the holotype.

Paratypes: 31 ♂♀, taken with the types on wild garlic, *Allium canadense,* where the species was breeding in abundance.

This species is another example of geminate species, *geminata* being a southern twin of *planifrons* Knight which is known to occur from Iowa westward to South Dakota.

Lepidopsallus nyssae n. sp.

Closely allied to *miniatus* Knight but distinguished by pale brownish color and the relative lengths of antennal segments I and II.

♂. Length 3.02 mm., width 1.42 mm. Head: width .75 mm., vertex .31 mm. Rostrum, length 1.05 mm., just attaining posterior margins of middle coxae. Antennae: segment I, length .14 mm.; II, .79 mm.; III, .33 mm.; IV, .23 mm.; uniformly pale yellowish, two apical segments sometimes dusky. Pronotum: length .63 mm., width at base 1.15 mm.

Color pale brown to fuscous, never reddish as in *miniatus,* head, pronotum and scutellum dark fuscous to black, hemelytra pale brownish, sometimes becoming dark brownish, lateral apical half of corium fuscous, cuneus uniformly pale brownish, translucent, membrane fuscous, veins pale. Clothed with silvery scale-like pubescence and intermixed with pale yellowish to fuscous simple pubescence. Legs dark brown, apex of femora, tibiae and tarsi pale; tibial spines black, arising from brown spots which become obscure apically. Ventral surface uniformly dark brownish.

♀. Length 2.98 mm., width 1.59 mm. Head: width .79 mm., vertex .37 mm. Rostrum, length .96 mm., scarcely attaining posterior margins of middle coxae. Antennae: segment I, length .14 mm.; II, .67 mm.; III, .29 mm.; IV, .22 mm.; uniformly pale yellowish. Pronotum, length .67 mm., width at base 1.26 mm.

Color much paler than in male, dorsum uniformly pale brownish except anterior half of pronotum and head which are fuscous to black. Ventral surface pale brownish, mesosternum and genital segment brown, shining. Legs uniformly pale, bases of fore coxae brown, shining. Pubescence as in male.

Holotype: ♂, May 12, 1928, College Station, Texas (H. G. Johnston); author's collection.

Allotype: ♀, taken with the holotype.

Paratypes: 52 ♂♀, taken with the types on black gum, *Nyssa sylvatica,* where the species was breeding.

The writer has taken a large series of *Lepidopsallus miniatus* Knight at College Station, Texas, where the species breeds on post oak, *Quercus stellata. L. nyssae* n. sp., although closely related, is readily separated from *miniatus* Knight, the distinguishing characteristics being very constant.

Note on Eurymus eurytheme autumnalis.—In Comstock's fine book on the Butterflies of California, p. 51, it is stated that *autumnalis* is an early spring form, but is occasionally taken in the fall, "probably as a result of an early cold spell influencing the pupa." However, it occurs quite regularly and commonly in the fall at Boulder, Colorado. This year we are having a very warm fall, and *autumnalis,* in quite characteristic form, is very abundant, but by no means to the exclusion of true *eurytheme.*—T. D. A. Cockerell, Boulder, Colo.

BOOK NOTES.

Field Book of Ponds and Streams. An Introduction to the Life of Fresh Water, by Ann Haven Morgan, Ph.D. (G. P. Putnam's Sons, New York. $3.50.)

It was a great pleasure to the reviewer to read Dr. Morgan's book. It is one of those publications rare in our country, that escapes, on the one hand, the depths of professional terms; and on the other, the shallows of science and language, both so simplified as to become inane. On occasion we have drawn attention to the popular nature books published in England. These books, while scientifically correct, are yet set forth in simple language and free from a condensation that depends on the liberal use of portmanteau words or of many-syllabled technicisms. These English books adhere closely to demonstrated facts and are designed to inform persons with an intelligent although non-technical interest in the workings of nature. Dr. Morgan has achieved the same result signally well; and sets a difficult standard for other authors to follow.

The subject-matter embraces all the components of life in pond and stream, from their water and pebbles to their vertebrate denizens, through plants and protozoans to mollusks, fishes and reptiles. There are 300 line cuts, 15 plates in black and white and 8 in color, all excellent and many in the most artistic spirit. The correctness of these figures makes it easy to recognize the things they represent.

Naturally, in such a work it is not possible, nor even wise or desirable, to go at length into any one topic when (at a rough estimate) nearly 400 forms are mentioned in a field book limited to 450 pages. Insects occupy about one-fourth of the book; and of these, Dr. Morgan's favorite forms are referred to more in detail than the others, which does not detract from the book. The reviewer's own favorites, he feels, might have had a more extensive treatment. Much that is known about waterbugs and their habits is not mentioned, as, e.g., that the genus *Buenoa* is one among the limited number of insects that have haemoglobin in their blood, as shown by Dr. Hungerford; or the growth and development of the tiny *Microveliae*; or that the surface bugs have winged and wingless forms in the adults of the same species. But this is almost captiousness, to point out these absences in a work which as a whole is the best thing done in a popular way in this country on the life of ponds and streams.

The bibliography is helpful, but uneven in its references. Under some heads highly technical papers are listed, while under others only one or two general works are mentioned, the aquatic Heteroptera being among the sufferers. Since the date of Hungerford's Biology of Aquatic Hemiptera, numerous works on this group have been published by him, which might well have been included.

However, this work is to be judged as a fine whole; as such, it is a credit to the author and to the publisher. In fact, no general student of insects can well neglect it as a condensed source book on habits and ecology of the aquatic forms.

The price may seem high, but unfortunately, the cost of printing is heavy; and all the details that go to the making of a book are so costly that publishers must set their values up to be able to present such fine works as this to the public. Even so, it costs no more than the price of one theatre ticket, which, strange to say, is ungrudgingly bought to achieve an ephemeral and frequently worthless pleasure.

J. R. T.-B.

Blatchleyana. A List of the Published Writings of W. S. Blatchley, A.B., A.M., LL.D., of Indianapolis, Indiana, and Dunedin, Florida. Together with a chronology of his life; the fixation of types of new genera and species described by him, etc., etc. (Nature Publishing Co., Indianapolis. $1.10.)

The Editor has received from his friend, Dr. W. S. Blatchley, this brochure on his public life and labors—prepared, as he says, "mainly as a time saver for posterity." It contains in narrative form the principal public events of his busy life, and a complete list of all his publications.

Speaking as one of Dr. Blatchley's contemporaries, his marvelous industry and single-hearted devotion to the sciences he loves so well and has served so long, have made his fellows in many fields his debtors. These labors have assuredly opened to many vast horizons of the wonderful phenomena of nature and the mind back of it all.

Beginning his productivity in 1885, he has maintained it with scarce an interruption to this very day; and in this long period he has written six volumes and over 190 articles on Mollusca, geology and entomology in its various phases. Dr. Blatchley obviously has put Indiana on the map of science because, from whatever point, he has taught the love and appreciation of nature at all times. His is surely an enviable record; and these words are a personal tribute to him from the writer, who believes that appreciation in life is far better than posthumous eulogy.

Dr. Blatchley might well say, " Si monumentum requires, circumspice."

Meantime, he has produced something of great present use, for which his fellows should be grateful; and he has set an example which might well be followed by some of our high-pressure producers (including this one).

J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of May 15, 1930.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, May 15, 1930. President Davis in the chair, and twelve members present, viz., Messrs. Anderson, Bowdoin, Burke, Chapin, Cooper, Engelhardt, Lemmer, Lerch, Shoemaker, Sheridan, Siepmann and Torre-Bueno, and five visitors.

In the absence of the secretary, Mr. Siepmann acted as secretary pro tem.

The minutes of the previous meeting were read and approved, and Mr. Engelhardt presented the monthly report of the treasurer.

Mr. Torre-Bueno reported for the publication committee and announced that the next issue of the Bulletin would be out in two weeks.

Mr. Engelhardt moved that Dr. J. Douglas Hood, University of Rochester, Rochester, New York, be elected a member of the society, which was accordingly done.

He also read a communication concerning the death on May 1, 1930, of Dr. Barnes, of Decatur, Illinois, a member of the society since its reorganization, and an outstanding collector of Lepidoptera. Mr. Engelhardt said that the Barnes collection contained several thousand types of American species, and that it would be highly desirable that the collection remain in the United States.

A clipping from a Danish newspaper was exhibited acknowledging the bequest of a collection of Lepidoptera and Coleoptera to the Danish Zoological Museum by the late Dr. Herman Maeske, of Brooklyn, N. Y.

Mr. Cooper exhibited a large number of specimens of salt marsh Pselaphidae collected by him at Flushing, L. I. He also reported that he found *Isolomalus bistriatus* (Histeridae) common beneath oak bark at the same locality.

Mr. Davis exhibited a specimen of a hook tip moth, *Drepana arcuata* Walker collected by Burke and Davis near Richmond Valley, S. I., on April 20, 1930. This is an early date, other local records being in May and June.

Mr. Engelhardt spoke of his trip aboard the yacht *Peary*. Leaving San Francisco the first stop was Socorro, a small, rocky volcanic island five hundred miles off the west coast of Mexico. The island is uninhabited and occasional whalers are the only visitors, the blue whale being common in these waters. An attempt had once been made to raise sheep there, with the result that the island is overrun with them. Owing to the lack of human beings and predaceous animals on the island, the sheep are quite tame and barely alarmed by the approach of man.

Insects were rather sparse on the island, but some Cicindelidae and other insects were obtained. An attempt was made to ascend Mt. Everman, a high peak in the center of the island, but considerable difficulty was experienced due to lack of sufficient drinking water.

Proceeding toward the Panama Canal, large numbers of marine water striders of the genus *Helobates* were observed five to ten miles from land. The striders were very active, and only one specimen could be obtained. Flying fish were also common in these waters, some of them flying a hundred or more feet before touching the water. Thousands of Brentids, *Brentus anchorago,* were found beneath bark at Balboa, Panama. Mr. Engelhardt exhibited a large series of specimens which showed great variation in size.

After passing through the canal, Mr. Engelhardt visited his brother's coffee plantation in Guatemala. Enormous oak trees grow in this region, and he exhibited a large gall taken from one of them, from which were bred some clearwinged moths (*Aegeriidae*).

The meeting adjourned at 10.15 p. m.

CARL GEO. SIEPMANN,
Secretary pro tem.

MEETING OF OCTOBER 16, 1930.

A regular meeting of the Brooklyn Enomological Society was held at the Brooklyn Museum, on Thursday evening, October 16, 1930, at 8.10 p. m.

President Davis in the Chair and 17 members present, viz.: Messrs. Ballou, Bell, Bowdoin, Cooper, Engelhardt, Lemmer, Lerch, Ruckes, Schaeffer, Sheridan, Shoemaker, Siepmann, Torre-Bueno, Wilford, Wurster, Glanz, Dr. Risch, and 10 visitors.

Minutes of the previous meeting read and approved.

The report of the Treasurer was not presented.

Mr. Torre-Bueno reported briefly for the Publication Committee.

Mr. Schaeffer proposed for membership: Mr. A. Glanz, 1593 Bedford Avenue, Brooklyn, N. Y.

Mr. Glanz being present, it was regularly moved and seconded that the By-laws be suspended and the Secretary cast one ballot for the election of Mr. Glanz. The motion being carried the Secretary cast the ballot electing Mr. Glanz to membership.

Mr. C. W. Wurster, 15 West 11th Street, New York City, was next proposed for membership, and as he was also present the same procedure was followed as with Mr. Glanz and Mr. Wurster was duly elected to membership.

Mr. Cooper exhibited 21 species of Coleoptera, which he had collected on Long Island, and which are new to the New York State List. Mr. Cooper expects to later publish a paper recording these species in detail.

Mr. Schaeffer exhibited specimens of the following species of Coleoptera:

Dermestes peruvianus Cast.—A number of specimens taken on dried caribou skins at the Brooklyn Museum; also a specimen taken some years ago in Prospect Park, Brooklyn, by Mr. Schiffer. New to the United States.

Dermestes cadaverinus F.—A specimen was found in lower Manhattan by Mr. Siepmann. New to the New York State List.

Gibbium psylloides Czemp.—A specimen on dried caribou hide; Mr. Cooper found a specimen at Flushing on seaweed. New to Long Island.

Mezium americanum Lap.—Several specimens taken by Mrs Blenderman in one of her rooms in Brooklyn. New to Long Island.

Ptinus raptor Sturm.—Six specimens, 2 males and 4 females, were found in one of the school loan collection boxes of the Children's Museum containing a very small nest of *Vespa maculata* L. A European species new to the United States.

Mr. Pollard presented his paper "Collecting Insects on the Amazon." Mr. Pollard, as usual, gave a very interesting account of his recent trip up the Amazon River as far as Iquitos, Peru. He spoke particularly of his experiences collecting in the tropical forest, and of the insects which came aboard the boat, and also of his meeting the Rev. A. Miles Moss, of Para, Brazil, a keen entomologist who is doing a great deal of work in the life-history of the butterflies of that locality. Mr. Pollard is going to publish in detail the story of his trip. He exhibited a number of specimens from his captures.

At the conclusion of Mr. Pollard's remarks, Mr. Wm. T. Davis exhibited the following named four species of *Cicadas,* all of which had been attracted by the light at night on the boat on which Mr. Pollard proceeded on his journey on the Amazon: *Proarna insignis* Distant, one specimen; *Fidicina viridis* Oliv., two specimens; *F. bogotana* Distant, ten specmens, and *Fidicina mannifera* Fabr. two specimens. He further stated that the *Cicada* figured by Madam Merian in 1705, and named *tibicen* by Linné in 1758 from the figure, was evidently quite closely related to *mannifera,* and he showed a specimen from South America which he regarded as *Fidicina tibicen.* The name *tibicen* was for many years applied to several of our own native green and black species, and so has a particular interest to us.

Mr. Wilford exhibited a male specimen of *Celtiphaga celtis* Boisduval & LeConte, collected at Richmond, Staten Island, N. Y., on August 13, 1930. *Celtis* is locally of much less frequent occurrence than the allied species *Celtiphaga clyton* Boisduval & LeConte.

Mr. Davis exhibited a dragon-fly which had been placed on a thorn by a shrike. The specimen came from Florida.

Mr. Cooper remarked on a *Cecropia* larva which he had found at Flushing, N. Y., impaled on a thorn, presumably by a shrike.

Mr. Torre-Bueno exhibited living specimens of *Barce uhleri* Banks which he had obtained on October 13, 1930, while sifting at White Plains, N. Y. This small species of Hemiptera catches other small insects after the manner of a mantid.

Mr. Glanz reported having received a shipment of about 4,000 specimens of insects from Assam, India, a number of which he exhibited.

Mr. Torre-Bueno exhibited a copy of "Field Book of Ponds and Streams" by Ann Haven Morgan, published by G. P. Putnam's Sons, and remarked on the excellence of its treatment of the fauna and flora of these places.

Adjourned: 10.30 p. m.

E. L. Bell,
Secretary.

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